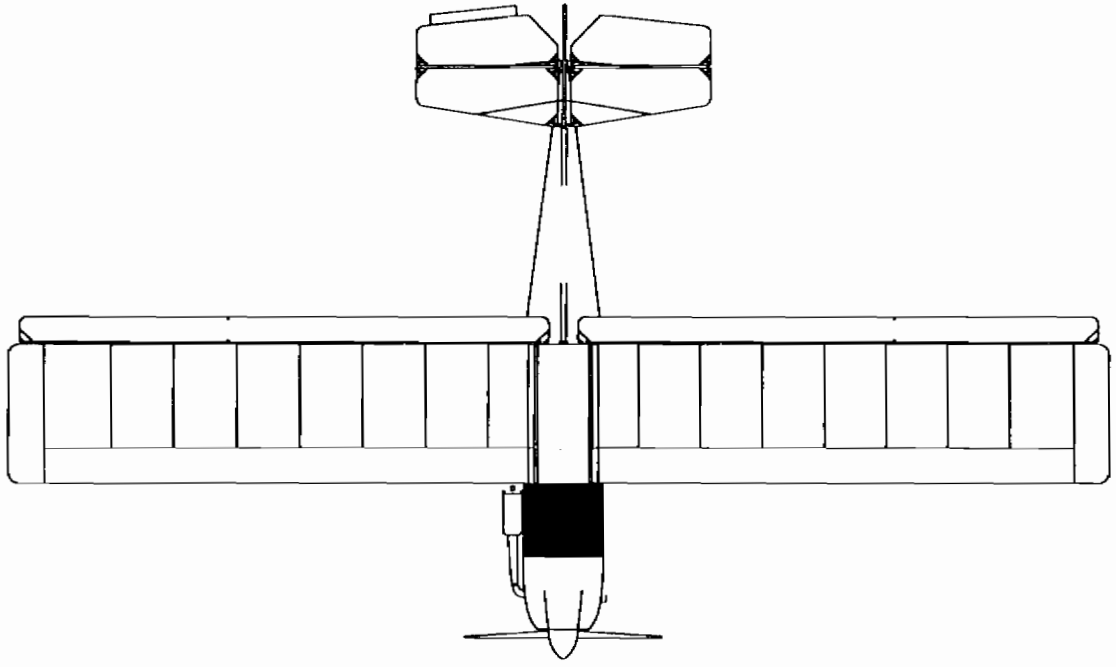
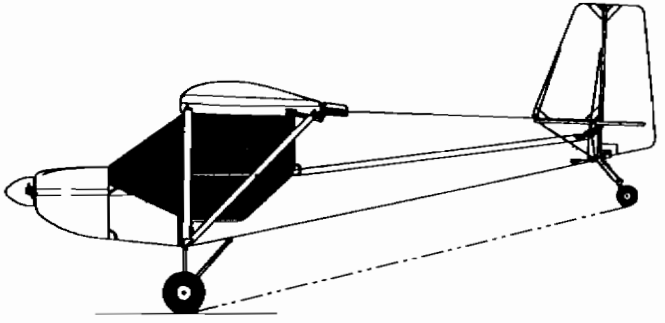
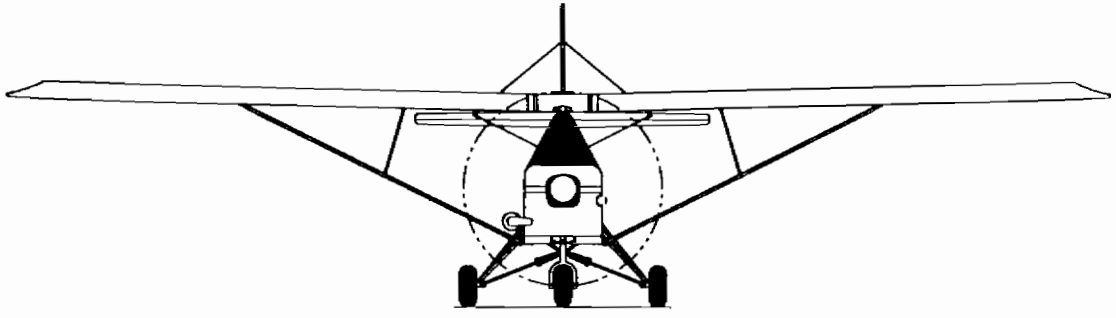
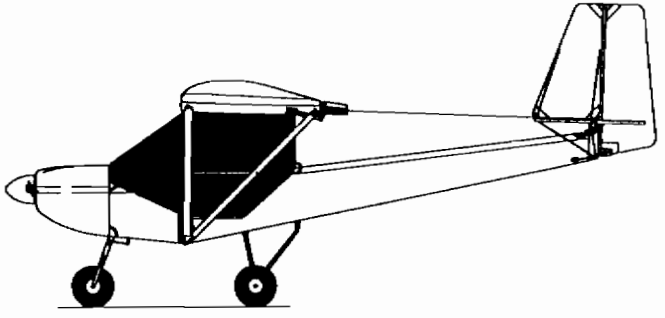
RANS S-4/S-5 COYOTE









RANS
4600 Highway 183 Alternate
Hays, KS 67601
(785) 625-6346

DESIGNED BY:
RANDY SCHLITTER

S-4/5 COYOTE I

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RANS INC.

4600 Highway 183 Alternate
Hays, KS 67601

Technical Support
(785) 625-0069

Parts Department
(785) 625-6346

When calling Technical Support please have the following ready:

- ❑ Aircraft Model
- ❑ Serial Number
- ❑ Engine Model
- ❑ Your Aircraft Assembly Manual

Note: Please make your questions precise and to the point so that we may assist as many customers as possible.

RANS Aircraft
Tool List

This is a partial list of tools that would be helpful when assembling a RANS airplane.

Hand Tools

Pliers
Needle nose pliers
Side cutters
Aviation snips
Hammer
Rubber mallet*
Center punch
Drift pin and punch set
Several small clamps

Safety wire pliers
Linesman pliers
Electrical wire stripers
Pop rivet tool
Click punch
Ball peen hammer
Scratch awl
Screwdriver set
Safety glasses

Wrench set SAE and metric
Ruler and tape measure

Socket set SAE and metric
2 or 4 ft. Level

Adjustable fly cutter*
Set of drill bits
Hack saw

Utility knife
Hole saw*
Files

Power Tools

Electric hand drill
Dremel*
Soldering gun
CD Player*

Small electric grinder*
Bench disk sander*
Heat gun*

Lubricants and Glues

Small can lithium grease
Contact cement
Super glue

Clear silicone
WD 40

* Not a necessary tool but helpful.

AN3 - AN8 AIRFRAME BOLTS

AN3-AN8 CADMIUM-PLATED STEEL BOLTS (DRILLED AND UNDRILLED)

A non-corrosion-resistant steel machine bolt which conforms to Specification MIL-B-6812. Cadmium-plated to Specification QQ-P-416.

Available with or without single hole through shank and/or single hole through head. Examples of part members for a cadmium plated steel bolt having a diameter of 1/4" and nominal length of 1".

AN4-6	For drilled shank
AN4-6A	Designates undrilled shank
AN4H-6	Drilled head, drilled shank
AN4H-6A	Drilled head, undrilled shank

NUT AND COTTER PIN SIZES

AN NUMBER — DIAMETER	PLAIN NUT AN NUMBER	CASTLE NUT AN NUMBER	COTTER PIN MS NUMBER
AN3 . . . . . 3/16	AN315-3R	AN310-3	MS24665-132
AN4 . . . . . 1/4	AN315-4R	AN310-4	MS24665-132
AN5 . . . . . 5/16	AN315-5R	AN310-5	MS24665-132
AN6 . . . . . 3/8	AN315-6R	AN310-6	MS24665-283
AN7 . . . . . 7/16	AN315-7R	AN310-7	MS24665-283
AN8 . . . . . 1/2	AN315-8R	AN310-8	MS24665-283

HOW TO DETERMINE GRIP For Steel and Aluminum Aircraft Bolts
(Subtract Fractions Shown Below From Length of Bolt)

AN 3 to AN 8	AN NUMBER, Diameter, and Threads per Inch	AN3 10 -32	AN4 1/4 -28	AN5 5/16 -24	AN6 3/8 -24	AN7 7/16 -20	AN8 ½ -20
	Grip = Length Less	13/32	15/32*	17/32	41/64	21/32	25/32

*Formula does not apply for AN4-3. Grip for AN4-3 is 1/16.

DASH NUMBER -- NOMINAL LENGTH

-3 . . . 3/8	-6 . . . 3/4	-11 . . . 1 ⅛	-14 . . . 1 ½	-17 . . . 1 7/8	-22 . . . 2 1/4	-25 . . . 2 5/8
-4 . . . ½	-7 . . . 7/8	-12 . . . 1 1/4	-15 . . . 1 5/8	-20 . . . 2	-23 . . . 2 3/8	-26 . . . 2 3/4
-5 . . . 5/8	-10 . . . 1	-13 . . . 1 3/8	-16 . . . 1 3/4	-21 . . . 2 1/8	-24 . . . 2 ½	-27 . . . 2 7/8
						-30 . . . 3

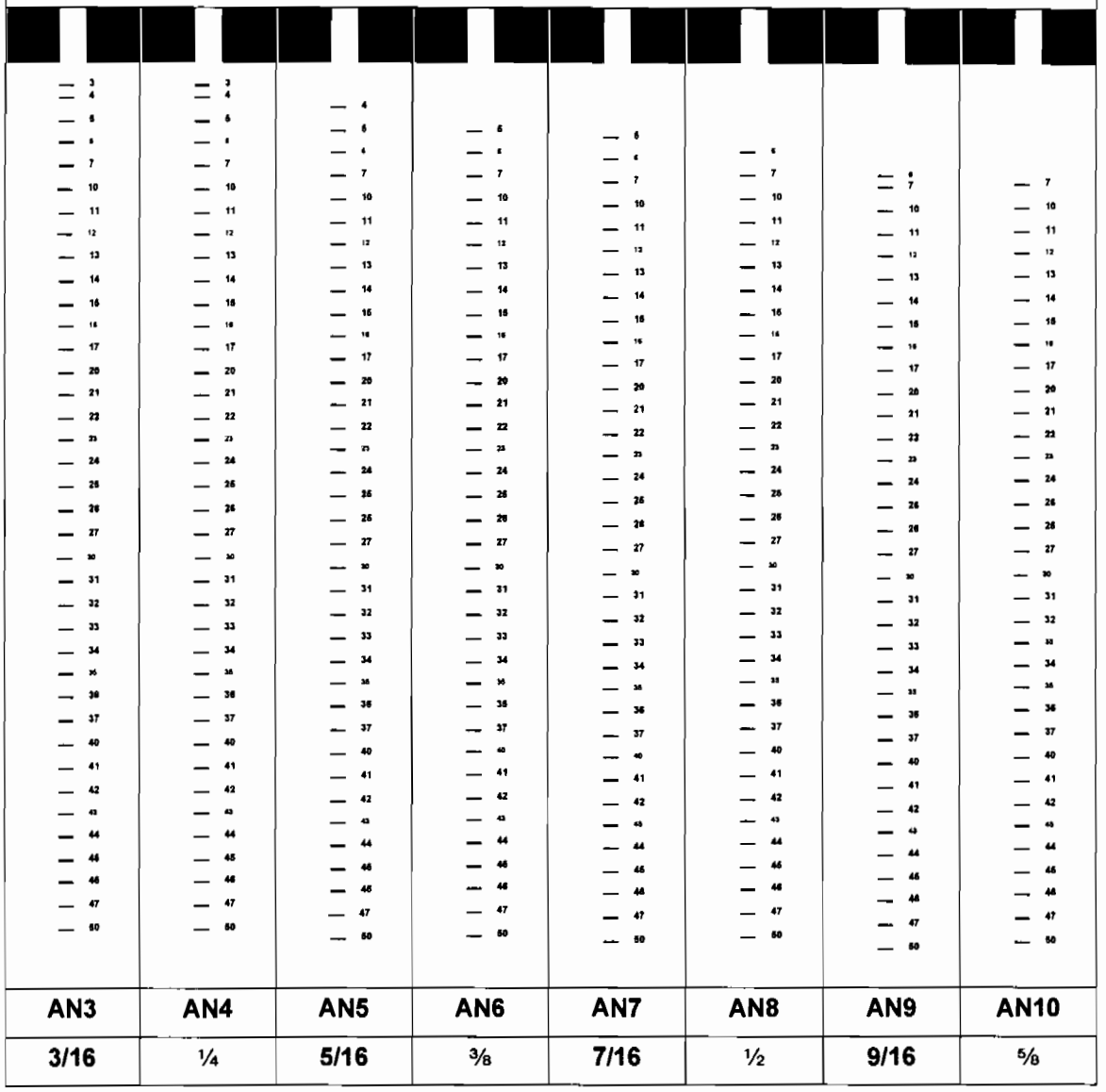
PART IDENTIFICATION

Use the above chart to determine lengths of bolts. Diameters are as follows:

AN3 = 3/16" AN4 = 1/4" AN5 = 5/16" AN6 = 3/8"

Use the parts manual for other part identification. The drawings depict a fairly accurate likeness of the real thing. Other parts are labeled by part number. Again, reference the parts manual to confirm part identity.

AN Bolt Gauge



AN3	AN4	AN5	AN6	AN7	AN8	AN9	AN10
3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8

EF-116

RIVETS CROSS REFERENCE LIST

DIA.	RANS	POP RIVET				CHERRY Q			
	NO.	NO.	SHER.	TNSL.	GRIP	NO.	SHER.	TNSL.	GRIP
3/32 (#41)	40APR1/8	AD32ABS	85	135	.031-.125	--	--	--	--
3/32 (#41)	40APR1/4	AD34ABS	85	135	.126-.250	--	--	--	--
3/32 (#41)	40APR3/8	AD36ABS	85	135	.251-.375	--	--	--	--
1/8 (#30)	30APR1/16	--	--	--	--	AAPQ-41	225	250	.0-.062
1/8 (#30)	30APR1/8	AD42ABS	155	235	.063-.125	AAPQ-42	225	250	.063-.125
1/8 (#30)	30APR1/4	AD44ABS	155	235	.188-.250	AAPQ-44	225	250	.126-.250
1/8 (#30)	30APR3/8	AD46ABS	155	235	.313-.375	AAPQ-46	225	250	.251-.375
1/8 (#30)	30SSPR1/16	--	--	--	--	CCPQ-41	700	600	0-.062
1/8 (#30)	30SSPR1/8	SSD42SSBS	550	700	.031-.125	CCPQ-42	700	600	.063-.125
1/8 (#30)	30SSPR1/4	SSD44SSBS	550	700	.188-.250	CCPQ-45	700	600	.188-.312
1/8 (#30)	30SSPR3/8	SSD46SSBS	550	700	.251-.375	CCPQ-46	700	600	.251-.375
3/16 (#11)	12APR1/8	AD62ABS	315	500	.063-.125	AAPQ-62	500	450	.062-.125
3/16 (#11)	12APR1/4	AD64ABS	315	500	.126-.250	AAPQ-64	500	450	.126-.250
3/16 (#11)	12APR3/8	--	--	--	--	AAPQ-66	500	450	.251-.375
3/16 (#11)	12APR1/2	AD68ABS	315	500	.375-.500	AAPQ-68	500	450	.376-.500
3/16 (#11)	12SSPR1/8	--	--	--	--	CCPQ-62	1650	1300	.062-.125
3/16 (#11)	12SSPR1/4	SSD64SSBS	1000	1375	.126-.250	CCPQ-64	1650	1300	.126-.250
3/16 (#11)	12SSPR3/8	SSD66SSBS	1000	1375	.251-.375	CCPQ-66	1650	1300	.251-.375
3/16 (#11)	--	--	--	--	--	SSPQ-68	1050	825	.376-.50
3/16 (#11)	--	--	--	--	--	SSPQ-610	1050	825	.501-.625
1/8"	--	--	--	--	--	CCPQ-44	700	600	.126-.250
						AVEX RIVET			
1/8 (#30)	--	--	--	--	--	1691-0410	165	230	.031-.187

RANS S-4 / S-5
ASSEMBLY SEQUENCE

SPEEDY ASSEMBLY

A quick study of this assembly sequence reveals a primary time saver. The Aircraft is already covered and clear coated prior to final assembly.

Fuselage

Station 2 Assembly

Station 3 Assembly

Keel Assembly

Tailcone Assembly

Cockpit Assembly

Station 1 & Firewall Assembly

Floorboard & Rudder Pedal Installation

Door Assembly & Pre-Fit

Wings

Wing Assembly

Flap & Aileron Assembly

Tail Group

Vertical & Horizontal Stabilizer Assembly

Elevator Assembly

Rudder Assembly

Covering

Clear Coat

Final Assembly & Installation of all Parts & Components

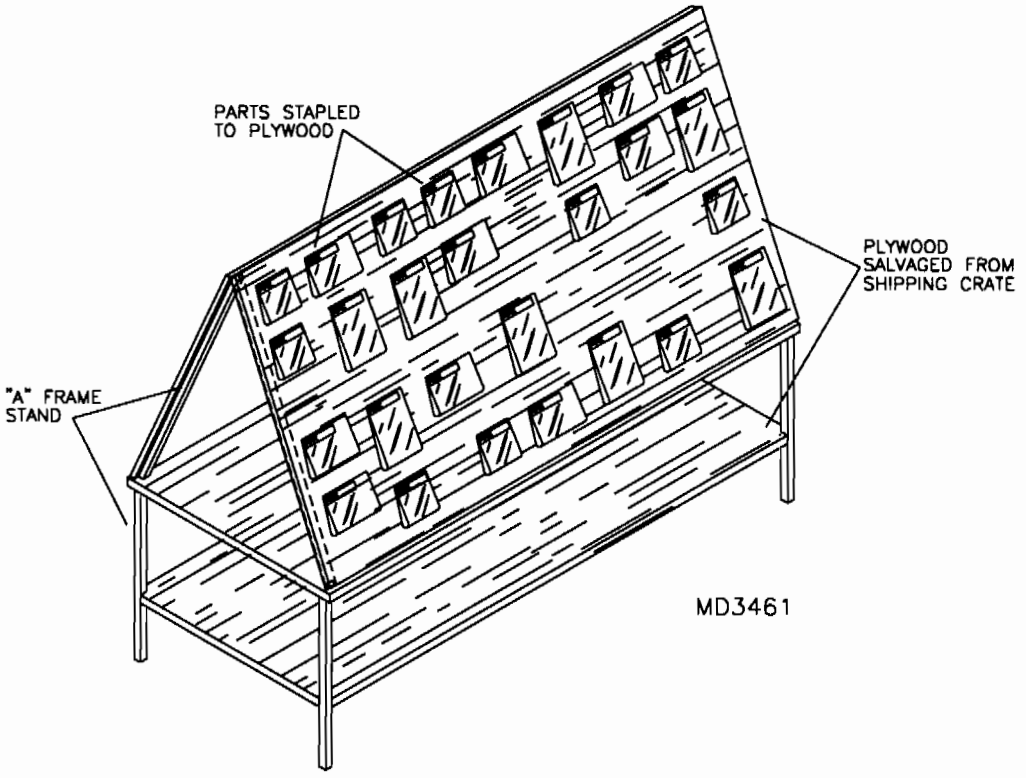
MD3623

S-4/5 COYOTE I

GENERAL INFORMATION

BEFORE BEGINNING:

TAKE INVENTORY: You must complete an inventory within 60 days of receiving your kit. We check and re-check and are 99.9% certain that if we say we shipped it, we did. The first task in building your kit is to inventory the parts using the packing list provided. It's your job to keep all parts organized and accounted for. We can not provide missing parts cost free after 60 days. Use the supplied pack list to verify that everything that we packed is in the box. The fast way to inventory, is to use the Priority Number that appears on the Part Number labels, these will match the pack list in numeric order. Go through the list item by item. If anything is not there that should be, please contact our parts department immediately. ***HINT:*** *Use sections of plywood from the packing crate to fabricate a part inventory board. As each part is inventoried and checked off on the pack list, staple the bag to the board. This allows for quick identification and part selection during assembly. We fabricate "A" Frame stands to support the plywood. Refer to the figure below. Plywood can also be attached to shop wall.*



PLEASE READ the manual cover to cover. This will speed up your build time considerably. Refer to the assembly sequence flow chart at the beginning of this section.

GET ORGANIZED! Prepare your workshop and be sure that what goes in the shop door will be able to come out!!!

KEEP IT CLEAN! The pre-sewn skins can soil easily! Wash your hands, tools and work tables. You will notice many of these parts are marked with part numbers. These wipe off with a cloth dampened with acetone or lacquer thinner. **CAUTION** Do not allow acetone, lacquer thinner or Loctite to come in contact with the Lexan glazing. These and other solvents will destroy the Lexan.

After drilling the holes they will need to be deburred. This is an **IMPORTANT** step and must be performed. Assembly of parts with burrs can cause stress risers and eventual part failure. Various tools can be used. An official deburring tool is nice but a ½" drill bit can do a good job on most holes. Radius and smooth sharp corners with files or fine grit sanders and grinders. Edges of certain parts also need deburring; a good file works for this.

A few special tools will be needed: A power drill, wrenches, pop riveter, air compressor, spray gun or regulator and a good respirator (if clear coating). "Clecos" make trial fitting and assembly go smooth on assemblies such as windows, cowling and firewall. If this proves to be too expensive, pop rivets can be used and drilled out. We have included extra just for this reason.

CLECOS: Included in your kit is a supply of clecos. These are temporary fasteners that will be used to hold things together while fitting and drilling. A pliers is also included to install and remove the clecos. The clecos are color coded as to hole size. Silver #40 Copper #30 Gold #11

To use, simply set the cleco in the special pliers, squeeze closed, insert into the hole and release. (Reverse for removal). You will find the clecos to be extremely useful throughout assembly.

RIVETS: Your kit is supplied with various sizes of aluminum and stainless steel pop rivets. Even though we are careful, there is always the chance of the packages being mis-labeled. So before riveting, be sure to double check that you have the correct aluminum or stainless steel pop rivet for the particular section you are working on.

STRUCTURAL STATIONS: Throughout the manual references will be made to structural stations. These are locations of formers or bulkheads from the nose to the tail of the aircraft. Observe the drawing in this section for locations.

FABRICATED PARTS: The builder is required to fabricate some small parts within the kit from the provided raw stock kit. The sizes of these parts will be called out as the parts are required.

A RANS Aircraft is almost as much fun to build as it is to fly and with a little care and planning, your ship could be a show stopper ..... Send us a picture of your work in progress or your finished plane and as always we're here to help. Give us a call if you run into a problem.

ROD ENDS: When installing rod ends and similar hardware, be certain at least ten threads are engaged, unless instructed otherwise within the text.

PLACARDS AND MARKINGS

Included in your S-4/5 kit is a decal sheet and gauge marking decal. These should provide you with just about every label/placard the FAA requires. Apply decals as per FAA recommendations. Affix the passenger warning decal to the instrument panel. Not included in your kit is the data plate and aircraft identifier plate. The data plate can be purchased from one of the aircraft supply houses such as Spruce & Speciality. The identifier plate (which is a fairly new requirement) can be made from a small 1" x 1 1/2" piece of aluminum. Hand stamp or engrave the make, model, and serial number and then rivet this to the tail channel with (2) 1/8" pop rivets just above the lower cinch strap. The Experimental decal is best applied along either door's bottom edge.

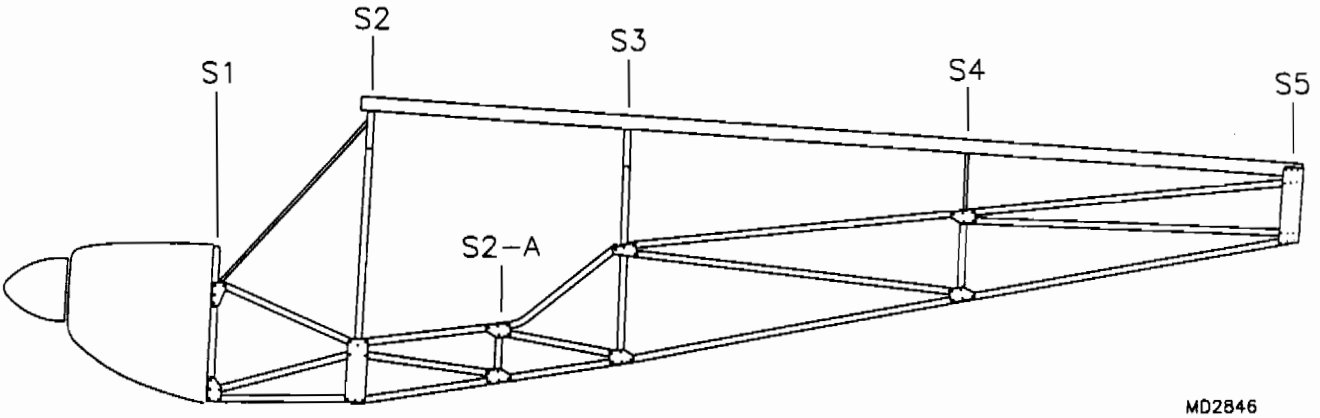
For the "N" number use 3" vinyl letters. Cole brand may be used which is available at most hardware stores, or most T-shirt or trophy shops will custom cut the stick on letters. These are placed about midway on the tailcone. Make sure the surface is clean before applying. If you clear coat your aircraft, apply the "N" number **AFTER** painting.

ASI MARKINGS FOR THE S-4 & S-5 COYOTE I

Apply the appropriate colored arcs on your ASI for the following speeds:

White Arc	35 mph to 60 mph (Stall to Maximum Flap Extension Speed)
Green Arc	40 mph to 70 mph
Yellow Arc	70 mph to 95 mph
Red Line	95 mph

S-4 & S-5 COYOTE I STRUCTURAL STATIONS



WARRANTY INFORMATION

KODIAK RESEARCH, INC.
P.O. BOX N7113
MARLBOROUGH HOUSE, CUMBERLAND ST.
NASSAU, N.P. BAHAMAS

PH: (809) 356-5377

Attn: O.E.M.'s

Date: October 31, 1991

Subject: Warranty Extension Requests

Dear Customer (RANS, INC),

1) In order for your customers (the builder) to receive their six month full warranty from time of first use, you must submit for extension on the enclosed form (please add your letterhead to this form.) If no request is received, warranty will begin from the date the invoice was sent to your customer (the builder).

2) Extension will be required, for any warranty outside the original six month period. This must be submitted prior to any claim or failure and cannot be applied retro-actively.

3) Supply a copy of the original customer request and reason for same as per guideline, submit with your verification on the request form.

4) All request must be submitted by manufacturer only. Any request for extensions from retail customers direct will be forwarded to the O.E.M. to process in the above format.

If you have any problem understanding this policy, please call for clarification.

CALCULATING WARRANTY

"When does the warranty start?"

1. The final owner should have a six (6) month period of operation to find any proven defective part in his engine or Rotax assembly.

2. There is, however, a one (1) year limit which starts on our invoice date to you. If we sold you an engine today, unless we hear from you, the warranty will end one year from today's date regardless of whether the engine was in the customers hand or dealer inventory.

EXAMPLE A: We invoice an engine to you today and two (2) weeks later the engine is sold to your customer and put into service. Six (6) months from date of sale to customer the warranty period is finished. (The customer has owned the engine for six (6) months.)

EXAMPLE B: Engine is invoiced to you today but not put into service (not sold by you) for 3, 4, 5, or up to 6 months later. Your customer still has 6 months warranty as it still falls in the one period to you.

EXAMPLE C: Engine is invoiced to you today, but for some legitimate reason, either at your end or at your customer's end, the engine cannot be put into service until 7 months or up to a maximum of the 12 months after the invoice date to you. Then, before the 12 months from invoice date to you are up, you advise us that the engine still has not been used an ask us for a one time, 6 month extension together with a valid reason. We ask permission from Rotax for a 6 month extension of that particular engine. To this date, we have not been refused a legitimate request for extension. In this case, warranty period will elapse 18 months from our invoice date to you.

3. As you can see, it is important to properly rotate your engine stock. Never send out a newly arrived engine if you still have older engines in house.

FAA PROCEDURES

--Obtaining an "N" Number

--Registration

--Obtaining An Airworthiness Certificate

OBTAINING AN "N" NUMBER

In order to register your plane, it will be necessary to obtain an identification number for the plane. This is referred to as an "N" number.

If any number is acceptable to you, write to the FAA Aircraft Registry, Dept. of Transportation, P.O. Box 25504, Oklahoma City, OK 73125 and ask them to assign you a free U.S. identification number of their choice.

If you prefer a number of your own choosing or a smaller number, you may be able to obtain the exact number you want by asking the FAA registry to assign you a specific number of your choice.

NOTE: U.S. identification numbers do not exceed 5 symbols in addition to the prefix "N". These symbols may be all numbers (N55555), one to four numbers and a suffix letter (N5555A or N5A), or one to three numbers and two suffix letters (N555AB).

If you request a special "N" number it would be best to list at least five choices in case your first choice is not available. A special number of your own choosing will cost $10.00 and you should enclose that fee with your letter.

When To Obtain Your "N" Number

If you plan to complete your kit within a very short time, it is recommended that you obtain your "N" number right away. If your project will be fairly lengthy, you will not need to obtain your number until the last several months of construction. Keep in mind that if you request a special "N" number it can be reserved for no longer than one year. If this number has not been affixed to the fuselage within this time and the registration completed, it will be necessary to pay an additional $10.00 to reserve that number for another year.

AFFIDAVIT OF OWNERSHIP FORM

Enclosed you will find an Affidavit of Ownership Form. This form should accompany your letter requesting the assignment of an "N" number.

This form must be notarized as it establishes your ownership to the airplane even though you know you did build it. It will be used by the FAA to create a file on your aircraft and will serve as a legal document and a **substitute for the Bill of Sale** (AC Form 8050-2) that a buyer gets when he buys any existing airplane.

REGISTERING YOUR AIRCRAFT

After you have written the Aircraft Registry requesting an "N" number, you will receive a form letter giving your number assignment. You will also receive a blank Aircraft Registration Form. (Sample Enclosed.) Complete the Application for Aircraft Registration (Form 8050-1) and return it to the Aircraft Registry along with the $5.00 registration fee.

Retain the **PINK** copy of the Registration and mail both the **WHITE** original and the **GREEN** copy. Your **PINK** copy is your authority to operate the aircraft, **when carried in the aircraft with an appropriate and current airworthiness certificate**.

RECEIVING AUTHORITY TO FLY YOUR AIRCRAFT

Registration alone does not authorize you to fly your aircraft. The aircraft must, after it has been properly registered, also obtain an Airworthiness Inspection by an inspector of the FAA, at which time the necessary Airworthiness Certificate may be issued. Then, and only then, is your aircraft ready for flight.

WHAT IS THE PROCEDURE FOR OBTAINING AN AIRWORTHINESS CERTIFICATE

Since the final step in obtaining an Airworthiness Certificate is to obtain an inspection of your airplane by an official of the FAA, it is a good idea to make an early contact with the FAA inspector's office nearest your home. Members of the local EAA chapter or a local flying service may be able to help direct you to this office. The purpose of such an early contact would be to discuss with the FAA representative, your proposed home built project and to generally familiarize yourself with the procedures established by the FAA for home built projects. At this time you can establish a tentative plan for inspection of the aircraft upon completion. The typical FAA inspector is interested in your project and wants to help you do a good job.

The FAA requires that everyone building an airplane must maintain a construction log of the work he does on his airplane. You can use a notebook of conventional size and keep a daily diary of the work done on your aircraft. Since all our planes come with assembly manuals, it is a good idea to also make notes in the manual as well as listing dates when certain procedures were done. It is a very good idea to take photographs of work on your plane in various stages. This helps to document that you, the builder, actually completed 51% of this kit. (Advisory Circular 20-27C available from the FAA or EAA describes the procedure used so that your logbook will be a verification of having complete at least 51% of the aircraft yourself.)

MY AIRCRAFT IS COMPLETED, ALL MARKING AND PLACARDS ARE IN PLACE. WHAT ELSE MUST I DO TO MY AIRCRAFT BEFORE I AM READY FOR MY PRE-CERTIFICATION INSPECTION?

Included in your manual is a weight and balance sheet. This will need to be completed before the inspection.

You will need to purchase a logbook for the aircraft, engine and propeller. These can be separate books or just one.

Have handy a copy of your Sales Invoice from us.

I FEEL I AM READY FOR INSPECTION BY THE FAA INSPECTOR, WHAT DO I DO?

If you have had prior contact with your FAA inspector, you will probably be familiar with the procedures used by that office. Different offices have slightly different procedures. Some inspectors will help you fill out the paperwork at the time of inspection. Others require that you submit the paperwork prior to inspection. If you are not sure and there are no other builders in your area to ask, you could call and ask the local office. Or you can submit the following to the Inspector's Office.

1. A letter requesting a final inspection.
2. Form 8130-12 Eligibility Statement (sample follows).
3. Form 8130-6 Application for Airworthiness Certificate (sample follows).
4. A 3-view drawing of the aircraft or photos of topside and front view. Include with this the following:

    Horsepower rating of engine and type of prop.
    Empty weight and maximum weight at which the aircraft will be operated.
    Number of seats and their arrangement (tandem, side by side).
    Whether single or dual controlled.
    Fuel capacity.
    Maximum speed at which you expect to operate the aircraft.

5. Estimated time or number of flights required. (Usually 25 hours for aircraft equipped with certified aircraft engine and prop combinations and 40 hours for those with non-aircraft engine propeller combinations.)

6. The area over which you will be testing. (Request an area encompassing a 25 mile radius for day VFR operations. Exclude congested areas and airways, but try to include nearby airports even if a few miles beyond the 25 mile radius.

Upon satisfactory completion of the necessary final FAA inspection of the aircraft and whatever ground tests may be required, the FAA Inspector will issue your amateur-built "Experimental" Airworthiness Certificate. Along with the certificate you will be given certain **"OPERATING LIMITATIONS"** under which you must operate the aircraft.

WHAT ARE THE SPECIAL REQUIREMENTS AS FAR AS ATTACHING NUMBERS AND PLACARDS TO HOME BUILT AIRCRAFT?

10-1 DISPLAY OF MARKS (Reference is FAR Part 45.23)

After you obtain the registration of your aircraft, the Registration numbers or marks must be affixed to the aircraft in some permanent fashion. The marks must be legible and have no ornamentation. They must contrast in color with the background.

The marks displayed on the aircraft shall include the letter "N" signifying U.S. Registry, followed by the registration number issued for the aircraft.

In addition, amateur-built(Experimental) aircraft must have displayed on that aircraft near each entrance to the cabin or cockpit, in letters not less than 2" not more than 6" in height, the word, "EXPERIMENTAL".

10-2 LOCATION OF MARKS ON FIXED WING AIRCRAFT (Reference is FAR Part 45.25)

(b) (1) If displayed on the vertical tail surfaces, horizontally on both surfaces, horizontally on both surfaces of a single vertical tail or on the outer surfaces of a multivertical tail. However, an aircraft on which marks at least 3" high may be displayed and in accordance with 45.29 (b)(1), the marks may be displayed vertically on the vertical tail surface.

(2) If displayed on the fuselage surfaces, horizontally on both sides of the fuselage between the trailing edge of the wing and the leading edge of the horizontal stabilizer. However, if engine pods or other appurtenances are located in this area and are an integral part of the fuselage side surfaces, the operator may place the marks on those pods or appurtenances.

10-3 SIZE OF MARKS

FAR 45.29 (b) (1) (iii) states "Marks at least 3" high may be displayed on an aircraft for which an experimental certificate has been issued under 21.191 (d) or 21.191 (g) for operating as an exhibition aircraft or as an amateur-built aircraft when the maximum cruising speed of the aircraft does not exceed 180 knots Calibrated Air Speed (CAS).

And © characters must be two-thirds as wide as they are high except "1" which must be one-sixth as wide as it is high and the letters "M" and "W" which may be as wide as they are high.

(d) Characters must be formed by solid lines one-sixth as thick as the character is high.

(e) Spacing. The space between each character may not be less than one-fourth of the character width.

10-5 IDENTIFICATION PLATE (Reference is FAR Part 45.11)

In addition to affixing the aircraft's registration number to the sides of the fuselage, the builder must also identify his aircraft by attaching an identification plate to the aircraft's structure.

This identification data required to be inscribed on the plate for amateur-built aircraft shall include the following information:

a. Builder's name and address
b. Model designation
c. Builder's serial number
d. Date of manufacture

The identification plate containing these essential elements must be of fireproof material and must be secured in such a manner that it will not likely be defaced or removed during normal service, or lost or destroyed in an accident. It must be secured to the aircraft at an accessible location near an entrance, except that if it is legible to a person on the ground it may be located externally on the fuselage near the tail surfaces.

The identification plate information must be marked thereon by etching, stamping, engraving, or other acceptable fireproof marking.

Metal plates which comply with these requirements may be purchased from the Experimental Aircraft Association for a very nominal fee.

AIRCRAFT INSTRUMENT MARKINGS & COCKPIT PLACARDS

Your reference is FAR Part 91.31 Civil Aircraft Operating Limitations and Marking Requirements

8-1 GENERAL

To insure that each person operating an aircraft does so within the operating limitations prescribed for it, the FAA requires that there is available in it a current Flight Manual, appropriate instrument marking and placards, **or any combination thereof**.

The purpose of the flight manual, markings and placards is to detail for the operator of the aircraft, the operational limitations prescribed for the aircraft.

In lieu of a flight manual, most amateur builders prefer to mark their instruments and to affix the necessary placards to the instrument panel as the primary means for complying with these requirements.

8-2 MARKINGS AND PLACARDS

The markings and placards necessary for the safe operation and handling of the aircraft should be displayed in a conspicuous place and may not be easily erased, disfigured or obscured. Such placards and markings should include but not necessarily be limited to the following criteria: Special emphasis on fuel system markings are very important; such as fuel valves-on-off fuel octane quantity, unusable fuel, minimum fuel for take-off, minimum fuel for inverted flight, etc.

8-3 POWERPLANT INSTRUMENT MARKINGS

Each required powerplant instrument should be marked to indicate the maximum and, if applicable, minimum safe operating limits with a **red radial line**.

Each normal operating range is to be marked with a **green arc** not extending beyond the maximum and minimum continuous safe operating limits.

Each engine speed range that is restricted because of excessive vibration should be marked with a **red arc**.

8-4 AIRSPEED INSTRUMENT MARKINGS

The airspeed indicator should be marked with a **red radial line** to establish the never-exceed speed. (Vne).

The takeoff and any pre-cautionary range should be marked with a **yellow arc**. The normal range is marked with a **green arc**. The flap actuation range is marked with a **white arc**.

8-5 AIRSPEED PLACARDS

There should be an airspeed placard in clear view of the pilot and as close as practicable to the airspeed indicator listing:

The design maneuvering speed.
The maximum landing gear operating speed (if applicable).
The maximum flap extension operating speed (if applicable).

8-6 LANDING GEARS

If a retractable landing gear is used, an indicator should be marked so that the pilot can, at any time, ascertain that the wheels are secured in their extreme positions.

Each emergency control should be **red** and must be marked as to method of operation and identity.

8-7 CONTROL MARKINGS

Each fuel tank selector should be marked to indicate the position corresponding to each tank and to existing cross feed position.

If safe operation requires the use of any tanks in a specific sequence, that sequence must be identified.

8-8 POWERPLANT FUEL CONTROLS

Each fuel tank selector should be marked to indicate the position corresponding to each tank and to existing cross feed position.

If safe operating requires the use of any tanks in a specific sequence, that sequence must be identified.

8-9 FLIGHT MANEUVER PLACARD

For non-acrobatic category airplanes, there should be a placard in front of and in clear view of the pilot stating: "No acrobatic maneuvers, including spins, approved.".

For acrobatic category airplanes, there should be a placard in clear view of the pilot listing the approved acrobatic maneuvers and the recommended entry airspeed for each. If inverted flight maneuvers are not approved, the placard must have a notation to this effect.

8-10 BAGGAGE PLACARD

The maximum baggage load permitted should be displayed in a conspicuous place adjacent to the baggage area.

8-11 PASSENGER WARNING PLACARD

A placard must be affixed to the aircraft so that it is readily seen in the cockpit. It will state: "Passenger Warning-This aircraft is amateur built and does not comply with the Federal Safety Regulations for Standard Aircraft". This placard is part of a set available for EAA. See section 10-5.

OPERATING LIMITATIONS

13-1 MANDATORY TEST FLIGHT PROVING PHASE

All amateur-built sport aircraft as well as standard aircraft have federally imposed operating limitations.

Upon satisfactory completion of the necessary final FAA Inspection of the aircraft and whatever ground tests may be required, the FAA inspector will issue your amateur-built "Experimental" Airworthiness Certificate.

He will also issue a form letter establishing the operating limitations applicable to your aircraft during its mandatory flight proving period. These Special Airworthiness Experimental Operating Limitations must be displayed in the aircraft at all times.

The operating limitations imposed on the aircraft during its flight proving period will be more stringent than those issued later after mandatory flight testing phase has been completed.

This phase may begin with the issuance of the aircraft's initial airworthiness certificate and the original operating limitations. At this time the FAA inspector will acquaint you with the requirements for a mandatory flight test and proving period. This flying will be confined to an assigned flight area approved by the FAA Inspector.

The presence of the FAA Inspector is not required, by regulation, at the initial flight of the experimental amateur-built aircraft. If time permits, however, it is not unusual for him to attend.

If he deems necessary, the inspector could issue a permit for a single flight within the boundaries of the airport and, upon witnessing the safe completion of the test, issue a further permit for more extended flights within the permissible area.

A tremendous responsibility for the safe operation of the experimental aircraft rests on the FAA Inspector. If the plane has any new and unusual features, he will naturally tend to treat its first flights with care. Also, pilot qualification and skill is a consideration.

13-2 PURPOSE OF THE FLIGHT TEST PERIOD

A flight test period is necessary to show to the FAA that the aircraft is controllable throughout its normal range of speeds and throughout all the maneuvers to be executed. It will also serve to prove that the aircraft has no hazardous operating characteristics or design features.

13-3 DURATION OF MANDATORY FLIGHT TEST PERIOD

For standard aircraft type engines: When an FAA approved aircraft engine/propeller combination is installed the flight test period is usually limited to 25 hours of flight time.

For non-aircraft type or automotive engines: An aircraft equipped with such an engine is required to be flown for a longer test period, usually at least 40 hours, to prove its reliability.

NOTE: It should be understood that the local FAA Inspector has the prime responsibility in determining the extent of the flight test period to be required for your aircraft. He is permitted to exercise considerable discretion in extending or in reducing the number of hours required to be flown during this period.

13-4 FLIGHT TEST AREA

The FAA Inspector will authorize the flight tests to be carried out in a designated and limited test area, usually within a 25 mile radius of the aircraft's base of operations.

He will insure the area selected is not over densely populated areas or in a congested airway.

In assigning the flight test area, the FAA Inspector may modify the size and shape of the area to suit the best purposes of the flight test program. In some locations, particularly around bigger cities where air traffic is heavy, a flight test area may not be practical. The builder must be prepared to except that an approved flight test area may not be the one chosen to him as the most convenient.

13-5 OTHER LIMITATIONS DURING THE FLIGHT TEST PERIOD

As a rule, the carrying of passengers or other crew members will not be permitted unless necessary to the safe operation of that aircraft.

13-6 AIRCRAFT FLIGHT LOG

During the flight test period, the pilot should record the aircraft flight history in an appropriate log book. This should be in addition to any engine tachourmeter or engine hourmeter that may be installed in the aircraft.

Specifically, the duration of each individual flight should be recorded including the number of landings made.

A full description of any mishaps, however minor, or any experiences not entirely normal that occur during the flight experience period should also be duly recorded.

Although not required, it is strongly recommended that all operating data be recorded flight by flight. Such information as airspeeds, cylinder head temperatures, etc., will be very valuable and may be used to determine or establish the various performance figures and operating characteristics of the aircraft.

Although the FAA Inspector is required by law to apply certain basic restrictions permanently to the amateur-built aircraft he is certificating, he can apply whatever other limitations he deems necessary at his own discretion. Unfortunately, nothing in the regulations states that the initial restrictions are required to be removed after successful completion of the test period....they only may be modified.

After the mandatory flight test period....then what?

REPAIRMAN'S CERTIFICATION

The Repairman's Certificate is applied for using the application form 8610-2, available from the local FAA offices. You should ask for this when you apply for your final inspection on your aircraft. You should also be familiar with the Appendix D of FAR part 43. (Items included in the Annual Condition Inspection.)

The Repairman's Certificate is only available to those who have built 51% or more of the specific aircraft they are having inspected.

Every twelve calendar months a condition inspection is performed in accordance with Appendix D of FAR part 43. The repairman has to include the aircraft total time in service, the name, the signature and the certificate type number of the repairman or A & P, who does the examination.

A & P mechanics must do the Annual Condition Inspection for those who are non-builders who own an amateur-built aircraft. On those aircraft where the builder has a Repairman's Certificate, it is recommended that from time to time the Annual Condition Inspection of those aircraft be done by an A & P simply as a check on the builder/repairman's work. One legal representative recommends that every other Annual Condition Inspection for a builder holding a repairman's certificate be done by an A & P mechanic.

FINAL INSPECTION

Listed below are two checklists. One is a sample checklist for condition inspection from the FAA and the other is an EAA safety checklist. These should be very helpful in getting your airplane signed off by the FAA Inspector and ensuring that your airplane is safe for operation.

APPENDIX 1. SAMPLE CHECKLIST FOR A CONDITION INSPECTION

AC 90-89

AIRCRAFT IDENTIFICATION:

TYPE/SN _____ ENGINE MODEL/SN _____

"N" NUMBER _____ PROPELLER MODEL/SN _____

A/F TOTAL TIME _____ ENGINE TOTAL TIME _____

OWNER _____ PROPELLER TOTAL TIME _____

	BUILDER		INSPECTOR	
GENERAL:	**Sat**	**Unsat**	**Sat**	**Unsat**
REGISTRATION/AIRWORTHINESS/OPERATING LIMITATIONS				
AIRCRAFT IDENTIFICATION PLATES INSTALLED				
EXPERIMENTAL PLACARD INSTALLED				
WEIGHT AND BALANCE/EQUIPMENT LIST				
WINGS:				
REMOVE INSPECTION PLATES/FAIRINGS				
GENERAL INSPECTION OF THE EXTERIOR/INTERIOR WING				
FLIGHT CONTROLS BALANCE WEIGHT FOR SECURITY				
FLIGHT CONTROLS PROPER ATTACHMENT (NO SLOP)				
FLIGHT CONTROL HINGES/ROD END BEARINGS SERVICEABILITY				
FLIGHT CONTROLS PROPERLY RIGGED/PROPER TENSION				
INSPECT ALL CONTROL STOPS FOR SECURITY				
TRIM CONTROL PROPERLY RIGGED				
TRIM CONTROL SURFACES/HINGES/ROD END BEARINGS SERVICE				
FRAYED CABLES OR CRACKED/FROZEN PULLEYS				
SKIN PANELS DELAMINATE/VOIDS (COIN TEST)				
POPPED RIVETS/CRACKED/DEFORMED SKIN				
FABRIC/RIB STITCHING/TAPE CONDITION				

LUBRICATION				
WING ATTACH POINTS				
FLYING/LANDING WIRES/STRUTS FOR SECURITY				
CORROSION				
FLIGHT CONTROL PLACARDS				
INSPECT FIREWALL FOR DISTORTION AND CRACKS				
INSPECT RUDDER PEDALS AND BRAKES FOR OPERATION AND SECURITY				
INSPECT BEHIND FIREWALL FOR LOOSE WIRES AND CHAFFING LINES				
CHECK CONTROL STICK/YOKE FOR FREEDOM OF MOVEMENT				
CHECK FLAP CONTROL OPERATION				
CHECK CABLE AND PULLEYS FOR ATTACHMENT AND OPERATION				
PERFORM FLOODLIGHT CARBON MONOXIDE TEST				
ENSURE THE COCKPIT INSTRUMENTS ARE PROPERLY MARKED				
INSPECT INSTRUMENTS, LINES, FOR SECURITY CHECK/CLEAN/REPLACE INSTRUMENT FILTER				
INSPECT COCKPIT FRESH AIR VENTS/HEATER VENTS FOR OPERATION AND SECURITY				
INSPECT SEATS, SEATBELTS/SHOULDER HARNESS FOR SECURITY AND ATTACHMENT				
CORROSION				
EMPENNAGE/CANARD:				
REMOVE INSPECTION PLATES AND FAIRINGS				
INSPECT CANARD ATTACH POINTS FOR SECURITY				
INSPECT VERTICAL FIN ATTACH POINTS				
INSPECT ELEVATOR/STABILIZER ATTACH POINTS				
INSPECT HINGES/TRIM TABS/ROD ENDS FOR ATTACHMENT AND FREE PLAY (SLOP)				
INSPECT EMPENNAGE/CANARD SKIN FOR DAMAGE/CORROSION				
INSPECT ALL CONTROL CABLES, HINGES AND PULLEYS				
INSPECT ALL CONTROL STOPS				
ENGINE:				
PERFORM COMPRESSION TEST #1 _____ #2 _____ #3 _____ #4 _____ #5 _____ #6 _____				
CHANGE OIL AND FILTER (CHECK FOR METAL)				
INSPECT IGNITION HARNESS FOR CONDITION AND CONTINUITY				
CHECK IGNITION LEAD CIGARETTES FOR CONDITION/CRACKS				
CLEAN AND GAP SPARK PLUGS				
CHECK MAGNETO TIMING/POINTS/OIL SEAL/DISTRIBUTOR				
INSPECT ENGINE MOUNT/BUSHINGS				
CHECK LANDING LIGHT OPERATION				

CHECK POSITION LIGHTS OPERATION				
CHECK ANTI-COLLISION LIGHT FOR OPERATION				
INSPECT ALL ANTENNA MOUNTS AND WIRING FOR SECURITY				
CHECK ALL GROUNDING WIRES (ENGINE TO AIRFRAME, WING TO AILERON/FLAP, ETC)				
INSPECT RADIOS/LEADS/WIRES FOR ATTACHMENT & SECURITY				
INSPECT CIRCUIT BREAKERS/FUSES/PANEL FOR CONDITION				
OPERATIONAL INSPECTION:				
VISUAL INSPECTION OF THE ENGINE/PROPELLER				
ALL INSPECTION PANELS AND FAIRINGS SECURE				
PERSONNEL WITH FIRE BOTTLE STANDING BY				
BRAKE SYSTEM CHECK				
PROPER FUEL IN TANKS				
ENGINE START PROCEDURES				
OIL PRESSURE/OIL TEMPERATURE WITHIN LIMITS				
VACUUM GAUGE CHECK				
MAGNETO CHECK/HOT MAG CHECK				
IDLE RPM/MIXTURE CHECK				
STATIC RPM CHECK				
ELECTRICAL SYSTEM CHECK				
COOL DOWN PERIOD/ENGINE SHUT DOWN				
PERFORM OIL, HYDRAULIC, AND FUEL LEAK CHECK				
PAPERWORK:				
AIRWORTHINESS DIRECTIVES				
RECORD FINDINGS AND SIGN OFF INSPECTION AND MAINTENANCE IN LOGBOOKS				

AFFIDAVIT OF OWNERSHIP FOR AMATEUR-BUILT AIRCRAFT

U.S. Identification Number: N12344

Builder's Name: John Q. Amateur

Model: RANS S-9 Serial Number: 1288054

Class (airplane, rotorcraft, glider, etc.): Airplane

Type of Engine Installed (reciprocating, turbopropeller, etc.): Reciprocating

Number of Engines Installed: 1

Manufacturer, Model, and Serial Number of each Engine Installed: Rotax 503 3572333

Built for Land or Water Operation: Land

Number of Seats: 1

The above-described aircraft was built from parts by the undersigned and I am the owner.

(Signature of Owner-Builder)

State of: Kansas

County of: Anywhere

Subscribed and sworn to me before this _____ day of _____ , 19_____ .

My commission expires _____.

(Signature of Notary Public)

THIS PAGE IS ONLY A SAMPLE

AC Form 8050-88 (9-75) (0052-00-559-0002) Supersedes previous edition

FORM APPROVED
OMB No. 2120-0042

UNITED STATES OF AMERICA DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION-MIKE MONRONEY AERONAUTICAL CENTER
AIRCRAFT REGISTRATION APPLICATION

CERT. ISSUE DATE

UNITED STATES REGISTRATION NUMBER N 1234Y

AIRCRAFT MANUFACTURER & MODEL
RANS S-9

AIRCRAFT SERIAL No.
1288054

FOR FAA USE ONLY

TYPE OF REGISTRATION (Check one box)

☒ 1. Individual ☐ 2. Partnership ☐ 3. Corporation ☐ 4. Co-owner ☐ 5. Gov't. ☐ 8. Non-Citizen Corporation

NAME OF APPLICANT (Person(s) shown on evidence of ownership. If individual, give last name, first name, and middle initial.)

John Q. Amateur

TELEPHONE NUMBER: (913) 888-8888

ADDRESS (Permanent mailing address for first applicant listed.)

Number and street: #1 Build-it Road

Rural Route: P.O. Box:

CITY	STATE	ZIP CODE
Anytown	KS	67601

☐ **CHECK HERE IF YOU ARE ONLY REPORTING A CHANGE OF ADDRESS**

ATTENTION! Read the following statement before signing this application. This portion MUST be completed.

A false or dishonest answer to any question in this application may be grounds for punishment by fine and / or imprisonment (U.S. Code, Title 18, Sec. 1001).

CERTIFICATION

I/WE CERTIFY:

(1) That the above aircraft is owned by the undersigned applicant, who is a citizen (including corporations) of the United States.

(For voting trust, give name of trustee: _____), or:

CHECK ONE AS APPROPRIATE:

a. ☐ A resident alien, with alien registration (Form 1-151 or Form 1-551) No. _____

b. ☐ A non-citizen corporation organized and doing business under the laws of (state) _____ and said aircraft is based and primarily used in the United States. Records or flight hours are available for inspection at _____

(2) That the aircraft is not registered under the laws of any foreign country; and

(3) That legal evidence of ownership is attached or has been filed with the Federal Aviation Administration.

NOTE: If executed for co-ownership all applicants must sign. Use reverse side if necessary.

TYPE OR PRINT NAME BELOW SIGNATURE

EACH PART OF THIS APPLICATION MUST BE SIGNED IN INK.

SIGNATURE	TITLE	DATE
John Q. Amateur	Builder/Owner	3/16/88
John Q. Amateur		

NOTE Pending receipt of the Certificate of Aircraft Registration, the aircraft may be operated for a period not in excess of 90 days, during which time the PINK copy of this application must be carried in the aircraft.

AC Form 8050-1 (12/90) (0052-00-628-9007) Supersedes Previous Edition

AC FORM 8050-1 IS A 3-PART FORM

THIS PAGE IS ONLY A SAMPLE

Form Approved
O.M.B. NO. 2120-0018

U.S. Department of Transportation
Federal Aviation Administration

ELIGIBILITY STATEMENT AMATEUR-BUILT AIRCRAFT

Instructions: Print or type all information except signature. Submit original to an authorized FAA representative. Applicant completes Section I thru III. Notary Public Completes Section IV.

I. REGISTERED OWNER INFORMATION

Name(s) John Q. Amateur

Address(es) #1 Build-it Road (No. & Street) Anytown (City) KS (State) 67601 (Zip)

Telephone No.(s) (913)888-8888 (Residence) ( ) (Business)

II. AIRCRAFT INFORMATION

Model RANS S-9

Engine(s) Make Rotax 503

Assigned Serial No. 1288054

Engine(s) Serial No.(s) 3572333

Registration No. N1234Y

Prop./Rotor(s) Make Sterba

Aircraft Fabricated: Plan ☐ Kit ☒

Prop./Rotor(s) Serial No.(s)

III. MAJOR PORTION ELIGIBILITY STATMENT OF APPLICANT

I certify the aircraft identified in Section II above was fabricated and assembled by John Q. Amateur
(Name of Person(s) (Please Print))
for my (their) education or recreation. I (we) have records to support this statement and will make them available to the FAA upon request.

— NOTICE —

Whoever in any matter within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals or covers up by any trick, scheme, or device a material fact, or who makes any false, fictitious or fraudulent statements or representations, or makes or uses any false writing or document knowing the same to contain any false, fictitious or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than 5 years, or both (U.S. Code, Title 18, Sec. 1001.)

APPLICANT'S DECLARATION

I hereby certify that all statements and answers provided by me in this statement form are complete and true to the best of my knowledge, and I agree that they are to be considered part of the basis for issuance of any FAA certificate to me. I have also read and understand the Privacy Act statement that accompanies this form.

Signature of Applicant *(In Ink)* John Q. Amateur — Date 3/16/88

IV. NOTARIZATION STATEMENT

THIS MUST BE NOTARIZED!

THIS PAGE IS ONLY A SAMPLE

Form Approved
O.M.B. No. 2120-0018

US Department of Transportation
Federal Aviation Administration

APPLICATION FOR AIRWORTHINESS CERTIFICATE

INSTRUCTIONS — Print or type. Do not write in shaded areas; these are for FAA use only. Submit original only to an authorized FAA Representative. If additional space is required, use an attachment. For special flight permits complete Sections II and VI or VII as applicable.

I. AIRCRAFT DESCRIPTION

1. REGISTRATION MARK	2. AIRCRAFT BUILDER'S NAME (Make)	3. AIRCRAFT MODEL DESIGNATION	4. YR MFR	FAA CODING
N1234Y	John Q. Amateur	RANS S-9	88	
5. AIRCRAFT SERIAL NO	**6. ENGINE BUILDER'S NAME (Make)**	**7. ENGINE MODEL DESIGNATION**		
1288054	Rotax	503		
8. NUMBER OF ENGINES	**9. PROPELLER BUILDER'S NAME (Make)**	**10. PROPELLER MODEL DESIGNATION**	**11. AIRCRAFT IS (Check if applicable)**	
1	Sterba	Wood 64 X 44	IMPORT	

II. CERTIFICATION REQUESTED

APPLICATION IS HEREBY MADE FOR: (Check applicable items)

A	1		STANDARD AIRWORTHINESS CERTIFICATE (Indicate category)		NORMAL		UTILITY		ACROBATIC		TRANSPORT		GLIDER		BALLOON
B		X	SPECIAL AIRWORTHINESS CERTIFICATE (Check appropriate items)												
	2		LIMITED												
	5		PROVISIONAL (Indicate class)	1		CLASS I									
				2		CLASS II									
	3		RESTRICTED (Indicate operation(s) to be conducted)	1		AGRICULTURE AND PEST CONTROL	2		AERIAL SURVEYING	3		AERIAL ADVERTISING			
				4		FOREST (Wildlife conservation)	5		PATROLLING	6		WEATHER CONTROL			
				7		CARRIAGE OF CARGO	0		OTHER (Specify)						
	4	X	EXPERIMENTAL (Indicate operation(s) to be conducted)	1		RESEARCH AND DEVELOPMENT	2	X	AMATEUR BUILT	3		EXHIBITION			
				4		RACING	5		CREW TRAINING			MKT SURVEY			
				0		TO SHOW COMPLIANCE WITH FAR									
	8		SPECIAL FLIGHT PERMIT (Indicate operation to be conducted, then complete Section VI or VII as applicable on reverse side)	1		FERRY FLIGHT FOR REPAIRS ALTERATIONS, MAINTENANCE OR STORAGE									
				2		EVACUATE FROM AREA OF IMPENDING DANGER									
				3		OPERATION IN EXCESS OF MAXIMUM CERTIFICATED TAKE-OFF WEIGHT									
				4		DELIVERING OR EXPORT	5		PRODUCTION FLIGHT TESTING						
				6		CUSTOMER DEMONSTRATION FLIGHTS									
C	6		MULTIPLE AIRWORTHINESS CERTIFICATE (Check ABOVE Restricted Operation and Standard or Limited, as applicable.)												

III. OWNER'S CERTIFICATION

A. REGISTERED OWNER (As shown on certificate of aircraft registration) — IF DEALER, CHECK HERE →

NAME	ADDRESS
John Q. Amateur	#1 Build-it Road Anytown, KS 67601

B. AIRCRAFT CERTIFICATION BASIS (Check applicable blocks and complete items as indicated)

	AIRCRAFT SPECIFICATION OR TYPE CERTIFICATE DATA SHEET (Give No. and Revision No.)		AIRWORTHINESS DIRECTIVES (Check if all applicable AD's complied with and give latest AD No.)
	AIRCRAFT LISTING (Give page number(s))		SUPPLEMENTAL TYPE CERTIFICATE (List number of each STC incorporated)

C. AIRCRAFT OPERATION AND MAINTENANCE RECORDS

	CHECK IF RECORDS IN COMPLIANCE WITH FAR 91.173.	TOTAL AIRFRAME HOURS	3 EXPERIMENTAL ONLY (Enter hours flown since last certificate issued or renewed) 0

D. CERTIFICATION — I hereby certify that I am the registered owner (or his agent) of the aircraft described above, that the aircraft is registered with the Federal Aviation Administration in accordance with Section 501 of the Federal Aviation Act of 1958, and applicable Federal Aviation Regulations, and that the aircraft has been inspected and is airworthy and eligible for the airworthiness certificate requested.

DATE OF APPLICATION	NAME AND TITLE (Print or type)	SIGNATURE
3/16/88	John Q. Amateur	John Q. Amateur

IV. INSPECTION AGENCY VERIFICATION

A. THE AIRCRAFT DESCRIBED ABOVE HAS BEEN INSPECTED AND FOUND AIRWORTHY BY (Complete this section only if FAR 21.183(d) applies)

2		FAR PART 121 OR 127 CERTIFICATE HOLDER (Give Certificate No.)	3		CERTIFICATED MECHANIC (Give Certificate No.)	6		CERTIFICATED REPAIR STATION (Give Certificate No.)
5		AIRCRAFT MANUFACTURER (Give name of firm)						

DATE	TITLE	SIGNATURE

V. FAA REPRESENTATIVE CERTIFICATION

(Check ALL applicable blocks in items A and B)

A. I find that the aircraft described in Section I or VII meets requirements for

		THE CERTIFICATE REQUESTED					
4		AMENDMENT OR MODIFICATION OF CURRENT AIRWORTHINESS CERTIFICATE					

B. Inspection for a special flight permit under Section VII was conducted by:

	FAA INSPECTOR		FAA DESIGNEE					
	CERTIFICATE HOLDER UNDER		FAR 65		FAR 121, 127 or 135		FAR 145	

DATE	DISTRICT OFFICE	DESIGNEE'S SIGNATURE AND NO	FAA INSPECTOR'S SIGNATURE

THIS PAGE IS ONLY A SAMPLE

EAA Safety Check List

Spend some time with your plane and this check list before those first flights. Thirty minutes with a pencil here may be worth the rest of your life.

	Yes	No
PROPELLER		
1. Blades		
Laminations not separated?		
Breaks, scratches, nicks tipping?		
Loose rivets in tipping?		
Drain holes in tip clear?		
2. Hub		
Any cracks or corrosion?		
Hub properly seated and safetied?		
3. Control Mechenism		
Oil leaks?		
Worn bearings?		
Secure?		
4. Attachment		
All bolt & nut threads undamaged?		
All bolts & nuts secured & safetied?		
5. Spinner		
Cracks?		
Properly secured?		
Is spinner chafing into prop?		
ENGINE & ENGINE COMPARTMENT		
1. Fuel System		
All lines of approved type?		
All strainers clean?		
All lines secured against vibration?		
Gascolator bowl at low point in system when aircraft is in normal ground position?		
Fuel drains operative?		
All connections properly tightened?		
2. Oil System		
All lines of approved type?		
All lines secured against vibration?		
Oil tank has no cracks or leaks?		
Tank properly secured & safetied?		
All plugs & strainers cleaned & safetied?		
3. Ignition-Electrical System		
All wiring proper type and gauge?		
All fastenings secured & safetied?		
Magnetos properly grounded?		
Spark plugs cleaned & undamaged?		
Spark plugs properly torqued?		
Engine grounded to airframe?		
Starter/generator secured?		
4. Exhaust Manifold		
Secured and safetied?		
All geskets in good condition?		

	Yes	No
ENGINE & ENGINE COMPARTMENT		
All stacks in good condition-no cracks or rusted-out areas?		
Carb heat and cabin heat muffs removed and manifold inspected?		
5. Controls		
All secured and safetied?		
No excessive play in any linkages?		
No interference between any control and the structure throughout the full operating range?		
Carb heater gate open & close fully?		
6. Mount		
Secured and safetied?		
All joints inspected for cracks?		
Any bends in mount tubes?		
Bushings in good condition?		
7. Cowlings		
Secured and/or safetied?		
All latches or fastenings working properly?		
Any cracks properly checked or reinforced?		
Cowlings clean?		
8. Power Plant in General		
All necessary safeties, palnuts, locknuts, etc. in place?		
No fuel or oil leaks?		
All accessories secured & safetied?		
FUSELAGE-HULL		
1. Structure		
All welds sound?		
All tubing straight and uncracked?		
No rust or corrosion?		
All attach fittings sound, no cracks, elongation of holes or worn threads?		
All rivets properly installed?		
Inspection openings for all vital areas?		
Fuselage properly drained, that is, no built-in moisture traps?		
Firewall of proper fireproof material?		
2. Cover		
Properly attached?		
No tears, distortions, or abrasions?		
Any breaks or ruptures properly repaired?		
3. Control System		
Properly secured and safetied?		
Controls stops provided & adjusted?		
All fittings of proper thread & size?		

	Yes	No
FUSELAGE-HULL		
All pulleys of proper diameter for bends, proper size for cable, and guarded?		
All cable of proper size (1/8" min) and condition?		
Any parts in system subject to rotation for any reason properly secured and safetied?		
Return springs on rudder pedals?		
No interference between any control part (cable, tube or linkage) and any other part of the structure throughout full control movement?		
Adequate room for full control throw when aircraft is occupied?		
Controls arranged to minimize danger of blocking by foreign objects?		
Grip properly secured to control stick or wheel?		
4. Electrical System		
All grommets, particularly in firewall, snug fitting and in good condition?		
All wires of proper gauge, insulated, and secured?		
Wires do not rest on abrasive surfaces?		
Battery installation of sufficient strength?		
Battery properly ventilated and drained?		
No corrosion at or around battery or its vents?		
Fuses of adequate amperage?		
5. Fuel System-Tanks		
Drains properly located to discharge clear of aircraft?		
All outlets properly screened?		
Breather inlets clear?		
Fuel shut-off valve installed?		
Fuel shut-off valve easily reached by pilot?		
All fuel lines of proper approved type?		
All fuel lines secured against vibration?		
Is tank located so that sufficient head is available in maximum climb with minimum fuel? Placard if necessary?		
Has tank sufficient expansion area?		
Any tank overflow discharge clear of hazardous areas on aircraft?		
Is tank support sufficient to meet strength requirements?		
Does tank clear surrounding structure?		
Do tank supports minimize strain and chafing?		

To insure its safe construction and operation, and to further emphasize the vital necessity for thorough consideration of every item which goes into your airplane, the following working check-list should be used, and it is suggested that it be made a part of the aircraft records.

	Yes	No
EXITS		
1. Can aircraft be cleared rapidly in case of emergency?		
Are special precautions available during test period, such as jettisonable doors or canopy?		
If parachute is to worn, does it clear all controls?		
Baggage Compartment		
1. Are walls and floors of sufficient strength to withstand flight loads?		
Can anything escape from baggage compartment by accident?		
Cabin-Cockpit		
1. Instruments		
Are all instruments functioning and accurate?		
Are all instruments marked, max pressures, temperatures, speeds?		
Are all vital instruments easily visible to pilot?		
2. Flight-Engine Controls		
Are all engine controls marked or easily identifiable?		
Are all engine controls smooth in operation, without excessive resistance, and easily available to pilot?		
Are all flight controls arranged so that jamming by dropped gloves, etc. is impossible?		
3. Fuel Systems		
Are all gas valves easily reached by pilot?		
Are all gas valves marked ON, OFF, LEFT, RIGHT?		
Are all gas valves in such a position that accidental operation is impossible or guarded in such a way that accidental operation is impossible?		
4. Seats		
Are seats of sufficient strength for maximum flight loads contemplated?		
Does seat "flex" enough at any time to interfere with flight controls?		
5. Safety Belts and Shoulder Harness		
Is installation and attachments of sufficient strength to meet 9G forward load minimum?		
Does attachment connect directly to primary structure?		
Are belts and harness in top condition?		
Is belt of correct size, that is, no long over-tongue?		
Is a separate belt and shoulder harness supplied for each occupant?		

	Yes	No
6. Heeting-Ventilation		
Is cabin or cockpit in negative pressure area and liable to suck in exhaust fumes?		
Is any provision made for ventilating cabin other than normal leakage?		
7. Windshield-Windows		
Are windshield and windows of recognized aeronautical materials?		
Is windshield braced against positive or negative pressures in flight, either by design or extra bracing?		
WING-TAIL SURFACES		
Fixed Surfaces		
Are all interior fastenings secured and/or safetied?		
Is interior properly weatherproofed?		
Have any mice been inside lately?		
Movable Surfaces		
Are stops provided, either at wing or somewhere else in the control system?		
Are all hinges and brackets sound?		
Are all hinge pins secured and safetied?		
Is there any excessive play in hinges?		
Is there any excessive play in control cables or tubes?		
External Bracing		
Is the interior of all struts weather protected?		
Are all adjustable fittings locked, secured, and safetied?		
Are struts undamaged by bends or dents?		
Are all wires serviceable with proper end fittings?		
Attach Fittings		
Are bolts of proper size installed?		
Are all bolts secured and safetied?		
Have all bolts been examined for wear?		
Flight Control Mechanism		
All cables and tubes unbroken or unbent & with proper end fittings?		
All control attachments secured and safetied?		
All pulleys free from interference and guarded?		
All torque tubes and bell cranks in good condition?		
No interference with fuselage or wing structure throughout full control travel?		
Fuel Tanks		
(See Fuselage Section Also)		
Are drains supplied at low point in tank when aircraft is in normal ground position?		

	Yes	No
Fuel overflow drains clear of aircraft - no tendency for overflow to soak into aircraft structure?		
LANDING GEAR		
Properly lubricated?		
Proper oleo inflation?		
Shock cords or springs in good condition?		
All attach fittings uncracked and sound?		
All bolt holes not elongated?		
All attach bolts secured and safetied?		
Brake lines in good condition?		
Brakes operating properly?		
Correct hydraulic fluid in lines?		
Wheels uncracked?		
Tires unworn & properly inflated?		
Excessive side play in wheel bearings?		

GENERAL

ALL BOLTS WHEREVER POSSIBLE, HEAD UP AND FORWARD.

All exterior fastenings visible from cockpit or cabin should have safetied end toward pilot, wherever possible.

A complete walkaround inspection of the aircraft should be accomplished to check that every bolt visible on the exterior is secured and safetied. That there is no visible structural damage. That all inspection panels and covers are in place and attached. That all parts of the aircraft are in proper alignment.

DON'T FORGET TO PUT IN ENOUGH GAS PRIOR TO THAT FIRST FLIGHT - GROUND RUNNING AND TAXI TESTS CAN USE UP A LOT MORE THAN YOU THINK!

OK - Kick the tires, add another coat of paint and AWAY WE GO!

WARRANTY INFORMATION

KODIAK RESEARCH, INC.
P.O. BOX N7113
MARLBOROUGH HOUSE, CUMBERLAND ST.
NASSAU, N.P. BAHAMAS

PH: (809) 356-5377

Attn: O.E.M.'s

Date: October 31, 1991

Subject: Warranty Extension Requests

Dear Customer (RANS, INC),

1) In order for your customers (the builder) to receive their six month full warranty from time of first use, you must submit for extension on the enclosed form (please add your letterhead to this form.) If no request is received, warranty will begin from the date the invoice was sent to your customer (the builder).

2) Extension will be required, for any warranty outside the original six month period. This must be submitted prior to any claim or failure and cannot be applied retro-actively.

3) Supply a copy of the original customer request and reason for same as per guideline, submit with your verification on the request form.

4) All request must be submitted by manufacturer only. Any request for extensions from retail customers direct will be forwarded to the O.E.M. to process in the above format.

If you have any problem understanding this policy, please call for clarification.

CALCULATING WARRANTY

"When does the warranty start?"

1. The final owner should have a six (6) month period of operation to find any proven defective part in his engine or Rotax assembly.

2. There is, however, a one (1) year limit which starts on our invoice date to you. If we sold you an engine today, unless we hear from you, the warranty will end one year from today's date regardless of whether the engine was in the customers hand or dealer inventory.

EXAMPLE A: We invoice an engine to you today and two (2) weeks later the engine is sold to your customer and put into service. Six (6) months from date of sale to customer the warranty period is finished. (The customer has owned the engine for six (6) months.)

EXAMPLE B: Engine is invoiced to you today but not put into service (not sold by you) for 3, 4, 5, or up to 6 months later. Your customer still has 6 months warranty as it still falls in the one period to you.

EXAMPLE C: Engine is invoiced to you today, but for some legitimate reason, either at your end or at your customer's end, the engine cannot be put into service until 7 months or up to a maximum of the 12 months after the invoice date to you. Then, before the 12 months from invoice date to you are up, you advise us that the engine still has not been used an ask us for a one time, 6 month extension together with a valid reason. We ask permission from Rotax for a 6 month extension of that particular engine. To this date, we have not been refused a legitimate request for extension. In this case, warranty period will elapse 18 months from our invoice date to you.

3. As you can see, it is important to properly rotate your engine stock. Never send out a newly arrived engine if you still have older engines in house.

S-1 ASSEMBLY

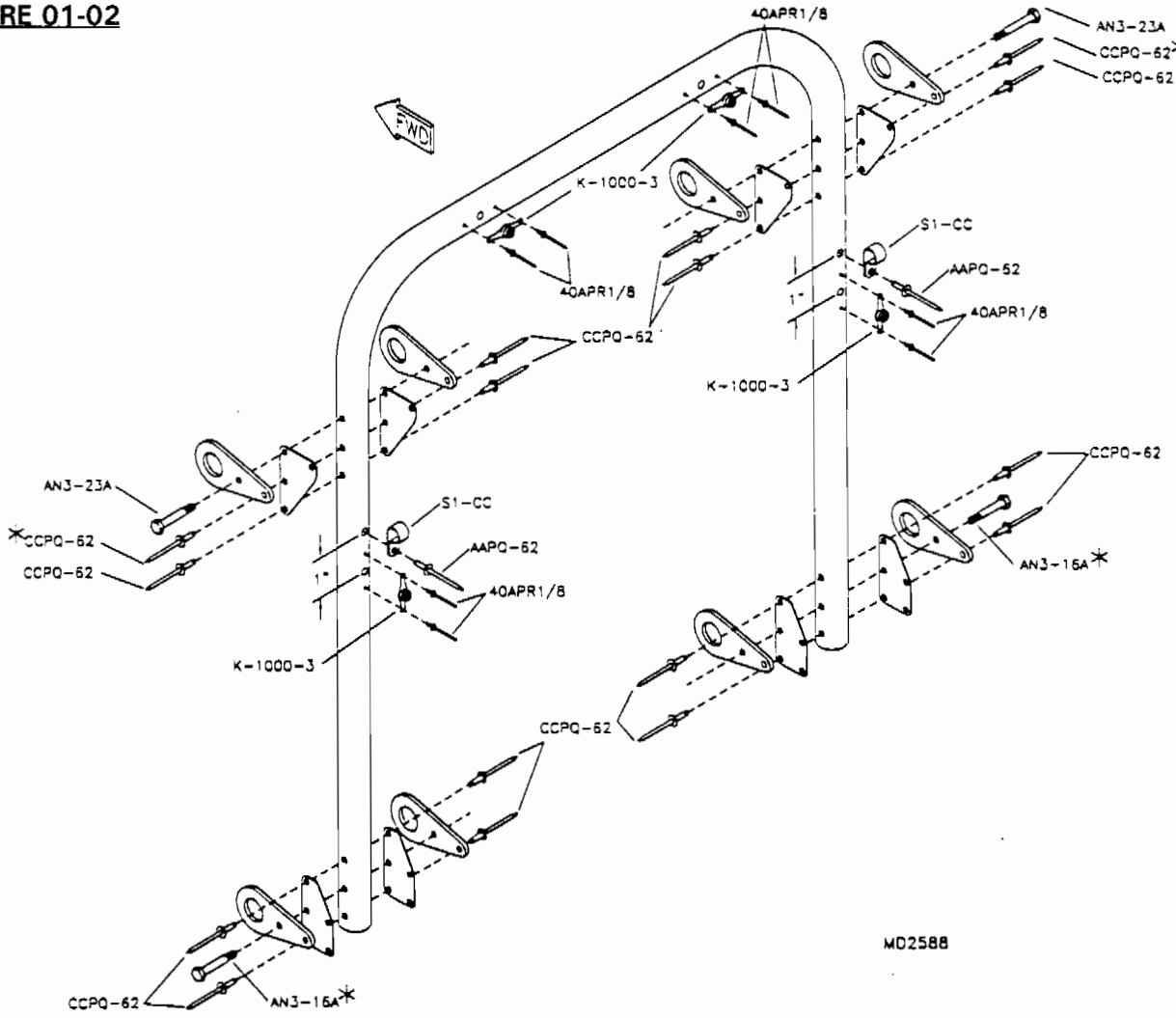
1. Pilot holes on sides of S1-XL align with holes in G-4 and G-5 gussets (see Fig. 01-02). Drill middle pilot holes at these locations to #11 and Cleco gussets in place. Drill other pilot holes to #11 through remaining holes of G-4 and G-5 gussets; mount gusset plates and engine mount firewall to S1-XL as shown in **FIGURE 01-02**. Be sure to rivet only the holes shown in **FIGURE 01-02** at this time.

NOTE: The standard technique used when only pilot holes are drilled is as follows:

Drill out one hole to #11 or 3/16" and pin with bolt or cleco. Drill out another and pin (if more than two holes are in the assembly). Next, drill all other holes to be riveted. Remove and debur on both sides. **HINT:** A simple effective debur tool can be an oversized drill bit, ½" works fine for 3/16".

2. Drill and insert one AN3-13A bolt through cowling tab hole to retain the nut plate on the S1-XL backside. Finger tighten the nut plate to the bolt. This will hold the nut plate over the hole during riveting. Drill #40 and rivet with hardware provided. See **FIGURE 01-02**. Repeat for all four locations.

FIGURE 01-02



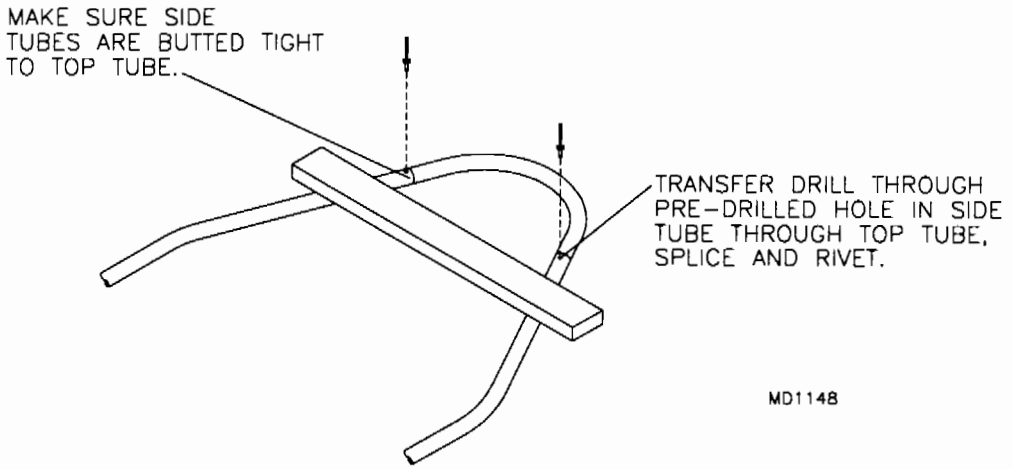
3. Locate and drill the conduit clamps in the locations shown in **FIGURE 01-02** using the hardware shown.

4. Insert the firewall isolators as per the parts drawing.

S-4 & S-5 S-2 ASSEMBLY

1. **HINT:** To remove labels use a heat gun. If adhesive remains, remove with rubbing alcohol. Slip the top tube into each S2 side tube. Lay the assembly on a flat surface. Using the pre-drilled holes in the side tubes as a guide, transfer drill through the side tubes into the top tube splice and rivet. Flip the assembly over and drill and rivet the other side. Refer to the parts drawing and **FIGURE 02-01**. **HINT:** Lay a straight board across the side tubes and apply downward pressure to help hold the parts in place and keep them aligned. It is important that the side tubes are butted tight against the top tube prior to drilling and riveting.

FIGURE 02-01



2. Chase drill the top center hole to 1/4" in all four G-8 gusset plates as shown in **FIGURE 02-02**. Chase drill the top hole in the S2 side tube to 1/4". Temporarily bolt the G-8 plates to the side tube and transfer drill through the bottom center hole in the gusset through the pre-drilled hole in the side tube with a 1/4" bit. Perform this step for both the inner and outer gusset on each side tube. Do not drill straight through from one side. Refer to **FIGURE 02-02A**.

FIGURE 02-02

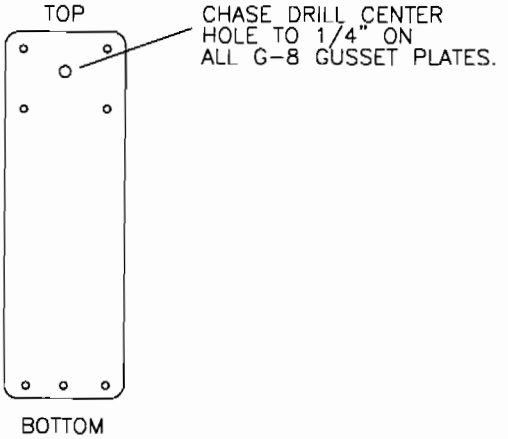
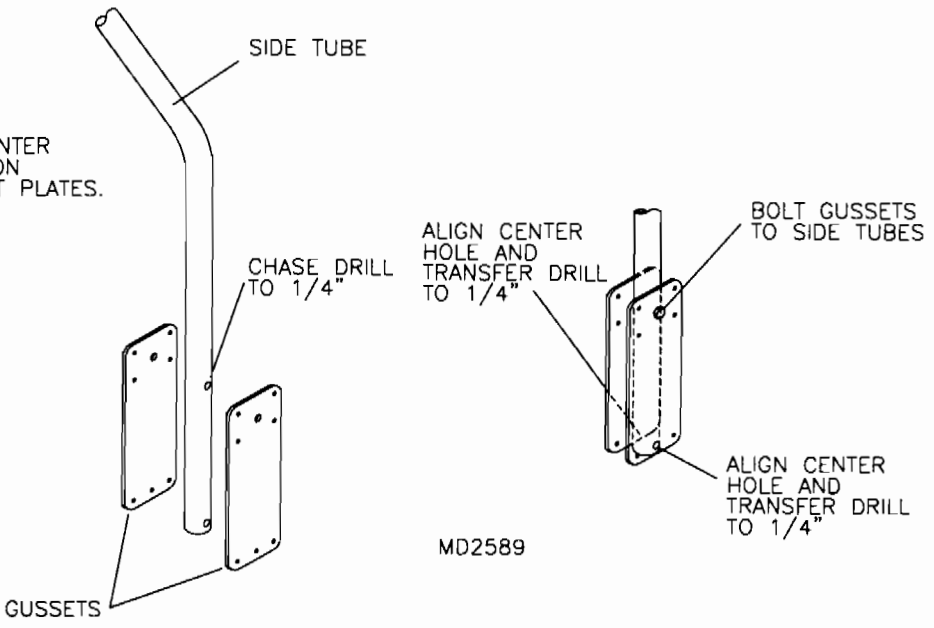


FIGURE 02-02A



3. Bolt the seat attach brackets to the top crossing tube with the hardware shown. Refer to the parts drawing and to **FIGURE 02-03**. Note the correct hole location in mounting these brackets. Install the I-nuts and compression tube fittings into the ends of the cross tube with the ½" braces and hardware as shown in **FIGURE 02-03A**. It may be necessary to deburr the inside of the tube ends.

HINT: Thread the I nut onto a 1/4" bolt of at least 1 ½" in length that has been slipped through the compression fitting. See **FIGURE 02-03B**. Push this assembly into the end of the tube and line up the hole in the insert nut with the hole in the tube and install the 3/16" bolt used to retain the I-nut. Note the correct orientation of the I-nut. Also be sure to install any additional parts onto the retainer bolt such as washers, brace tubes, etc., before threading on the nut.

FIGURE 02-03

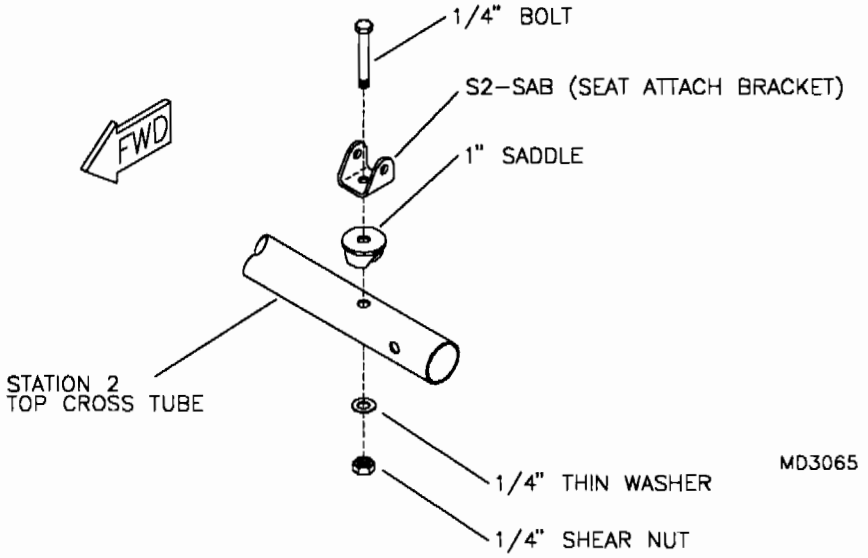


FIGURE 02-03A

NOTE:
BOLT IS SHOWN WITH HEAD FACING FWD. FORWARD IS THEN ESTABLISHED BY BOLT ORIENTATION. LATER THE INSTRUMENT PANEL WILL BE PLACED ON THE FWD SIDE OF THE S-2.

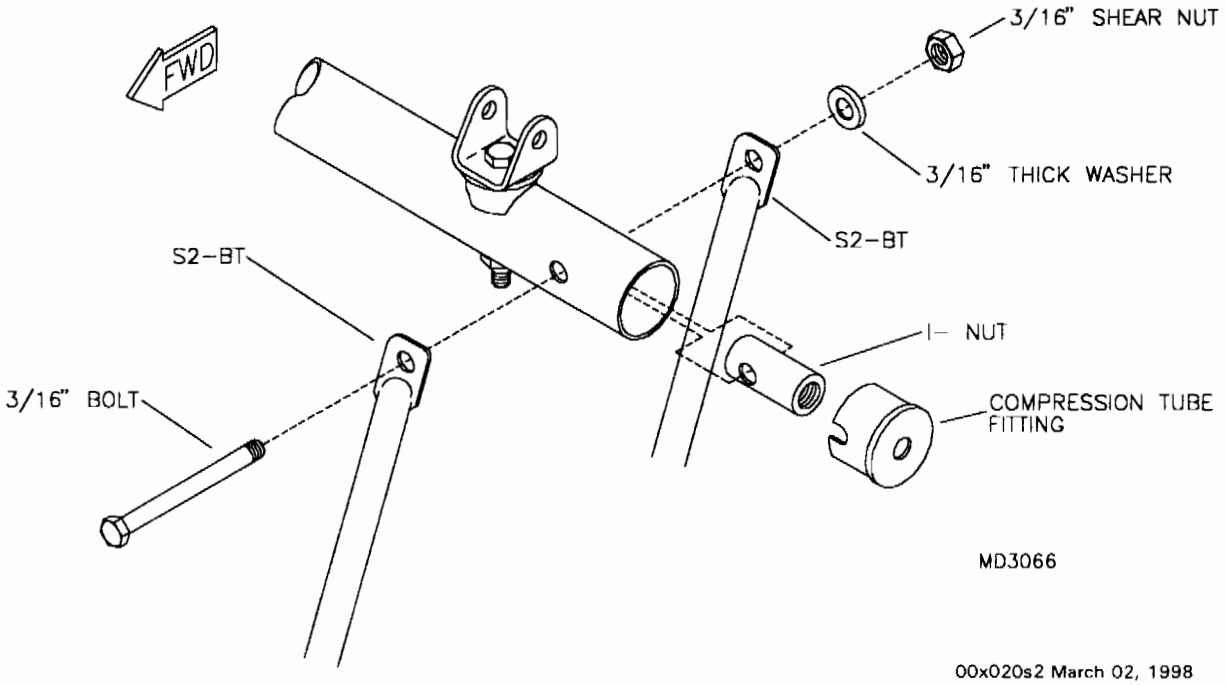
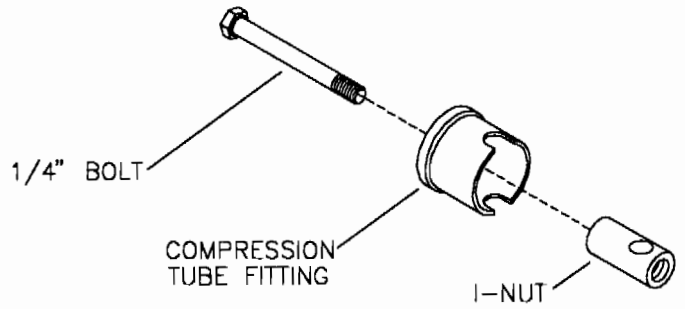


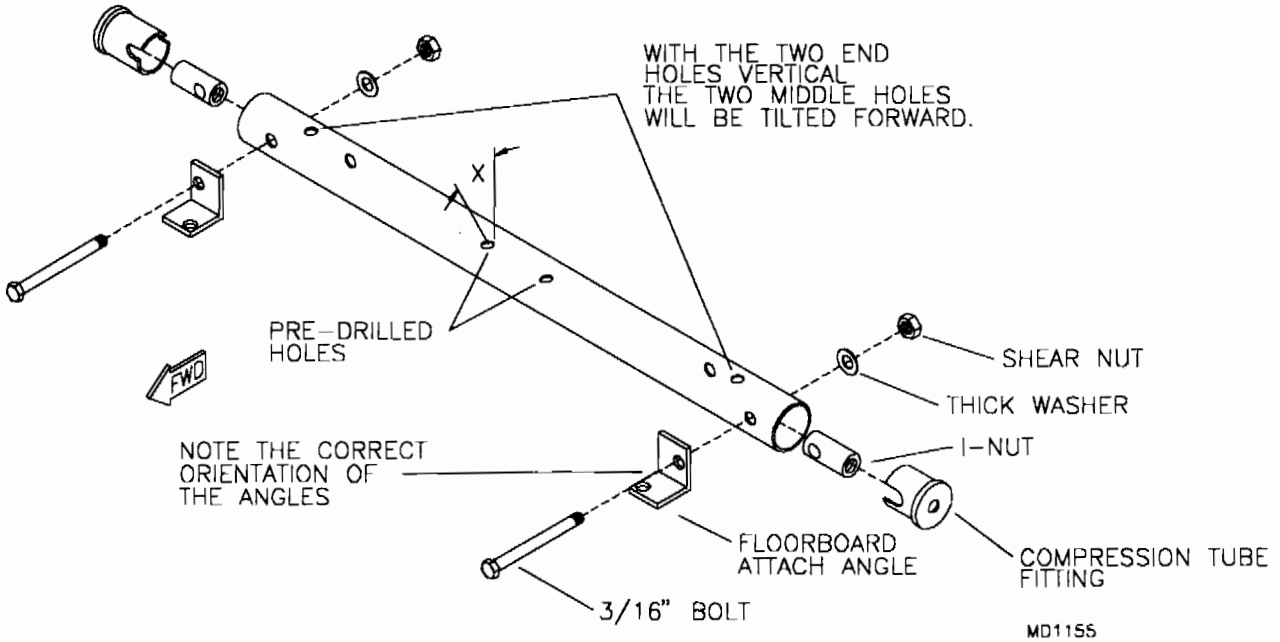
FIGURE 02-03B



4. **IMPORTANT:** Note that there is a forward and aft side to the station 2 bottom cross tube. The two holes near the center of the tube are the torque tube pillow block mount holes and are pre-drilled off of vertical center line. Position the tube so that the two holes that are located 1 3/4" in from each end are vertical. The two center holes must be tilted slightly forward when installed in the station 2 assembly. Determine the forward side of the tube by the tilt of the holes. The aft side of the tube is determined by two pre-drilled holes located approximately three inches in from each end. The aft holes at this location will be drilled through only the aft wall of the tube. Refer to **FIGURE 02-04**.

Slide the bottom cross tube sleeve inside the bottom cross tube and temporarily install the compression tube end fittings into each end to center the sleeve within the tube. It is important that the end fittings be fully inserted into the bottom cross tube. If the sleeve interfere with the installation of the fittings, it is acceptable to file a small amount off of the length of the sleeve or the end fitting. Find the pre-drilled holes located approximately three inches in from each end of the tube on the aft side and transfer drill into the sleeve using a #11 drill bit. Rivet the sleeve in place. Using a #11 bit, transfer drill through all other pre-drilled holes into the sleeve. Install the floorboard attach angles, I-nuts and compression tube end fittings following the same procedure as in the top crossing tube. If building and S-4 (Taildragger) only finger tighten the nuts at this time. Note that the floorboard attach angles bolt to the forward side of the bottom cross tube. Also note the orientation of each angle. Refer to **FIGURE 02-04**. The bottom cross tube is the same diameter as the top cross tube, however, the bottom tube is a heavier walled tube. As a result the compression tube end fittings will be more difficult to install in the bottom cross tube.

FIGURE 02-04



5. With the G-8 Gussets in place on the side tubes, apply loctite to the bolts and bolt the top cross tube between the inner gussets and side frames. Refer to the parts drawing. **NOTE:** The I-nuts do not have self locking capability. It is important to use loctite when installing a bolt into them.

Position the top cross tube so that the seat brackets are on top and in vertical alignment with the S2 side tubes. The diagonal brace tubes should be extending down. The bolt heads of the top cross tube denote the forward side of the station 2 assembly.

6. Temporarily bolt the bottom cross tube between the side tubes and gussets. Note the forward side of the cross tube and install correctly.

With a file radius the two outboard edges of the wing plate as shown in **FIGURE 02-06**. Slip two 5/8" shims over each wing plate retainer. Install the retainer and shims through the large hole in the wing plates from the bottom side. Slip the pin ring over the retainer shank extending above the wing plate until it bottoms on the top side of the wing plate. Refer to the parts drawing and **FIGURE 02-06A**. Remove the bolt retaining the bottom cross tube and install the wing plate assembly into the bottom end of the station 2 side tube as shown. Swivel the wing plate forward or aft, pivoting around the wing plate retainer. Align the holes in the retainer with those in the gussets, side tube and bottom cross tube. Apply loctite to the bolt and install.

Swivel the wing plate back in position so that the pre-drilled 5/16" hole in the inboard end of the plate is on centerline of the bottom cross tube and in approximate alignment with the pre-drilled hole in the tube. Using the wing plate as a drill guide, transfer drill through the plate and through the tube with a 5/16" drill bit. Chase drill the hole in the 1" saddles to 5/16" and install them with the correct hardware. Refer to the parts drawing and to **FIGURE 02-06A**.

FIGURE 02-06

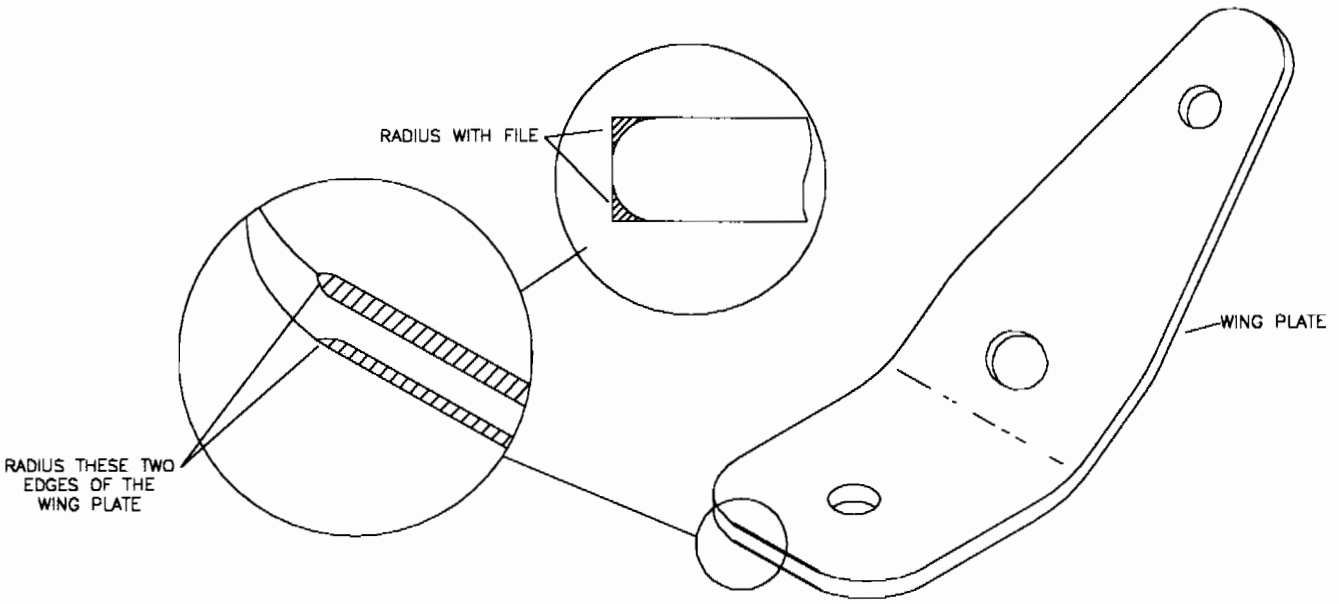
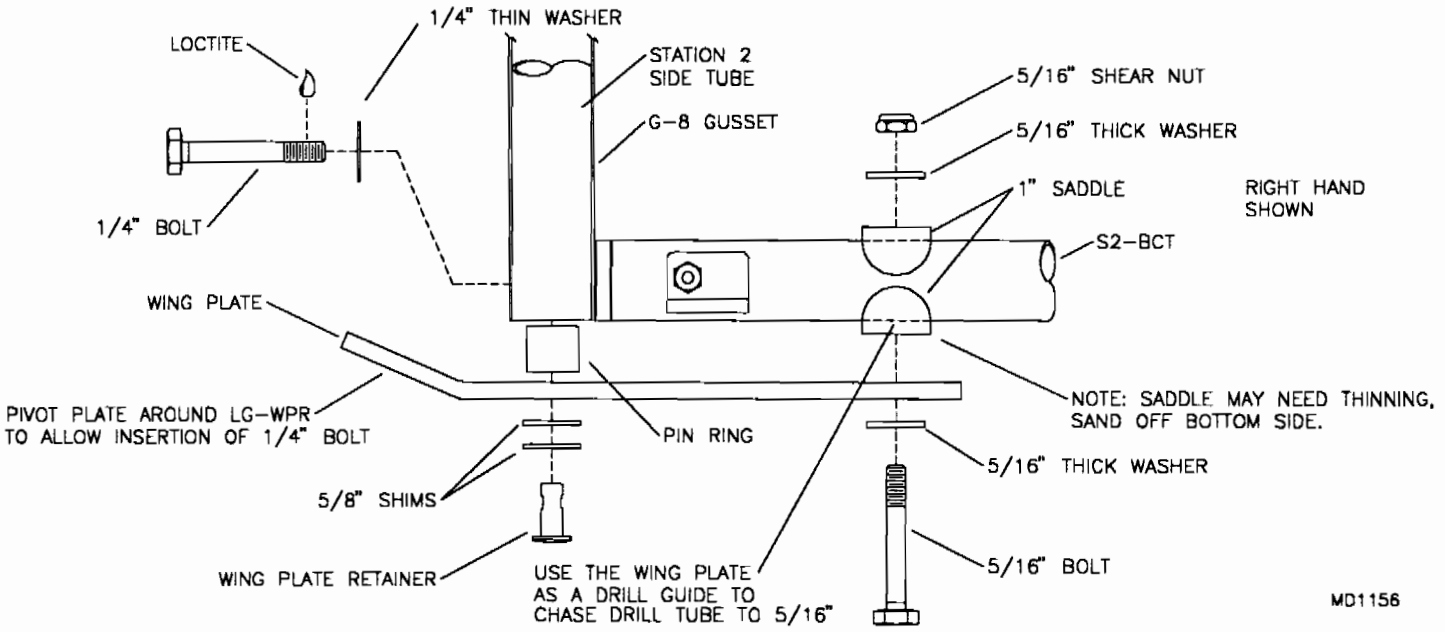
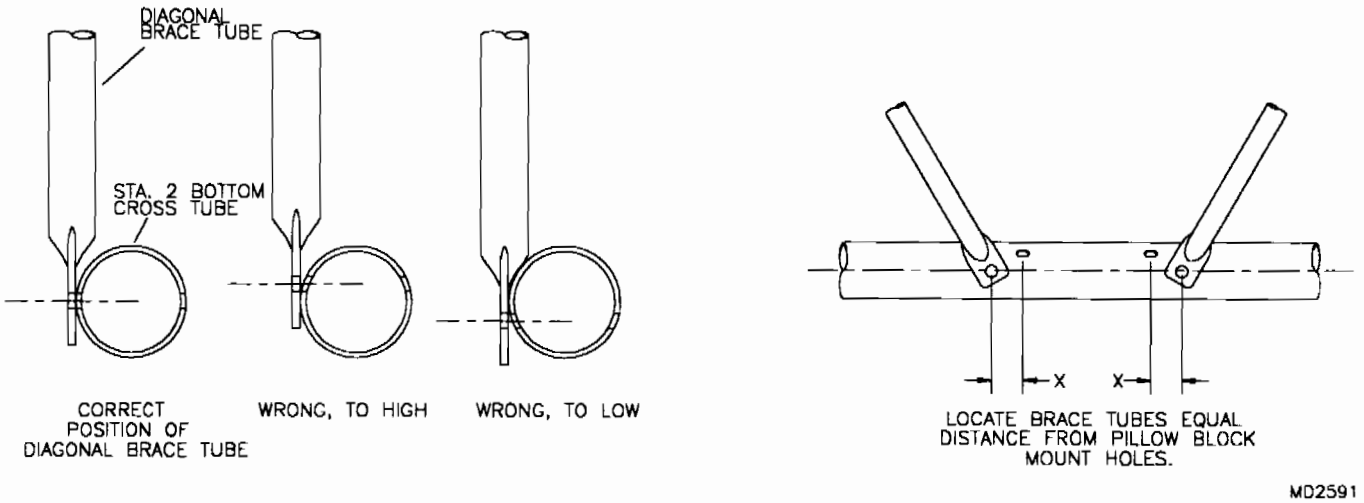


FIGURE 02-06A



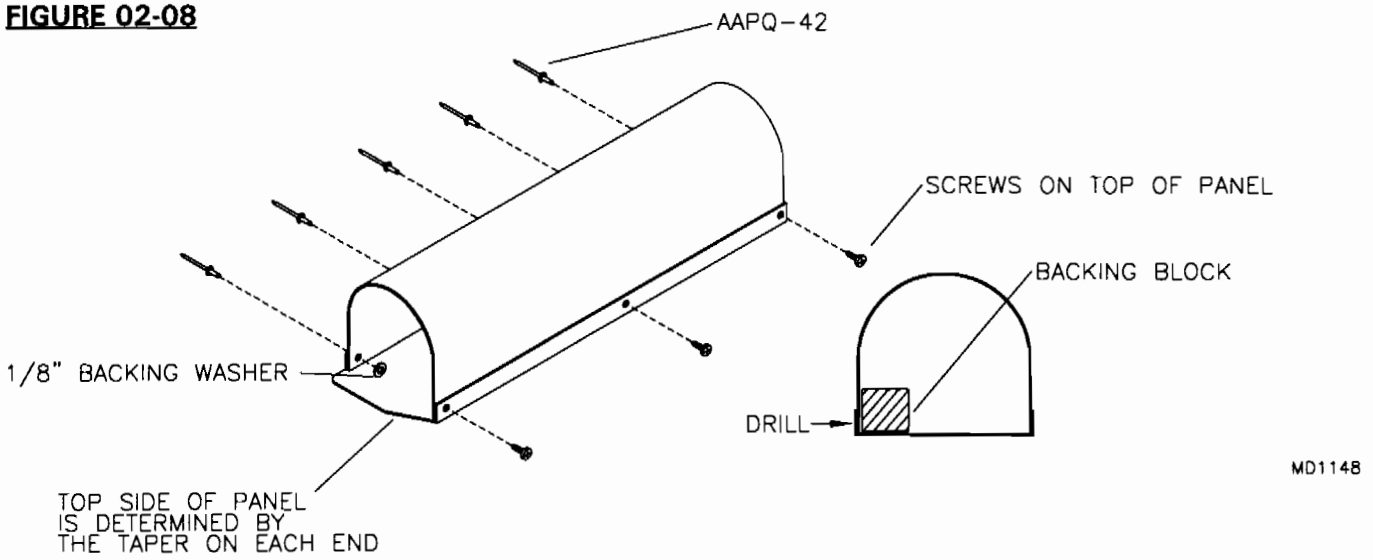
7. Position the ½" diagonal brace tubes so they contact the bottom cross tube's forward and aft center line radius. Transfer drill through the pre-drilled hole in the flattened end of the brace tube into the bottom cross tube on centerline and rivet. **NOTE:** The brace tubes should be evenly spaced on each side of the pillow block holes. See **FIGURE 02-07**.

FIGURE 02-07



8. Lay the instrument panel face down on a flat surface. **CAUTION:** To prevent scratching, lay a clean cloth or cardboard sheet down first. Note that there is a top and bottom to the panel. The top of the panel tapers on each end and has only three pre-drilled holes in the flange. Place the dust cover on the inside of the top flange and position it so that it is flush or evenly spaced on each end of the flange. With the cover in position and using a #30 drill bit, transfer drill through the pre-drilled holes in the flange and through the dust cover. Drill the center hole first, cleco and then drill the outside holes. Use a scrap piece of lumber as a backing block to hold the dust cover tight against the flange as you drill. Remove the dust cover and drill only the holes in the flange to 5/32. Using the screws provided, temporarily screw the dust cover to the top flange. Bend the dust cover and slip the free end into the inside of the bottom flange. Using the backing block and a #30 drill bit transfer drill through the pre-drilled holes in the bottom flange and through the dust cover. Start with the center hole and work out. Cleco as you go. Remove the screws retaining the top and pull the dust cover out of the top flange. Using the backing washers and the correct rivets, remove one cleco at a time and rivet the dust cover to the lower flange. Refer to the parts drawing and **FIGURE 02-08.** After the installation of the instruments and all wiring and plumbing has been installed, place the dust cover back under the top flange and retain with the screws.

FIGURE 02-08



9. **IMPORTANT:** Before proceeding, check your station 2 assembly. Make sure that you have all components orientated correctly. It is also important to note that the instrument panel is a structural member of the airframe. Elongated holes or poorly set rivets are not acceptable.

Place the S-2 assembly flat on a work bench so that the forward side of the assembly is facing up. Allow the G-8 gusset plates to hang over the edge of the bench so the assembly will lay flat. Measure up from the top side of the station 2 top cross tube 14 3/8" and place a mark on each side tube. Position the instrument panel so that the bottom edge of the panel is flush with the marks on the side tubes. The top of the instrument panel should also be parallel to the station 2 top cross tube. Refer to **FIGURE 02-09.** At this location the pre-drilled holes in each end of the instrument panel should be on centerline of each side tube. If not, it is acceptable to either pull together or spread apart the side tubes a small amount in order to obtain correct hole positioning. Refer to **FIGURE 02-09A.** With the instrument panel correctly positioned, transfer drill through the pre-drilled holes into the side tubes with a #30 bit and rivet the panel in place.

FIGURE 02-09

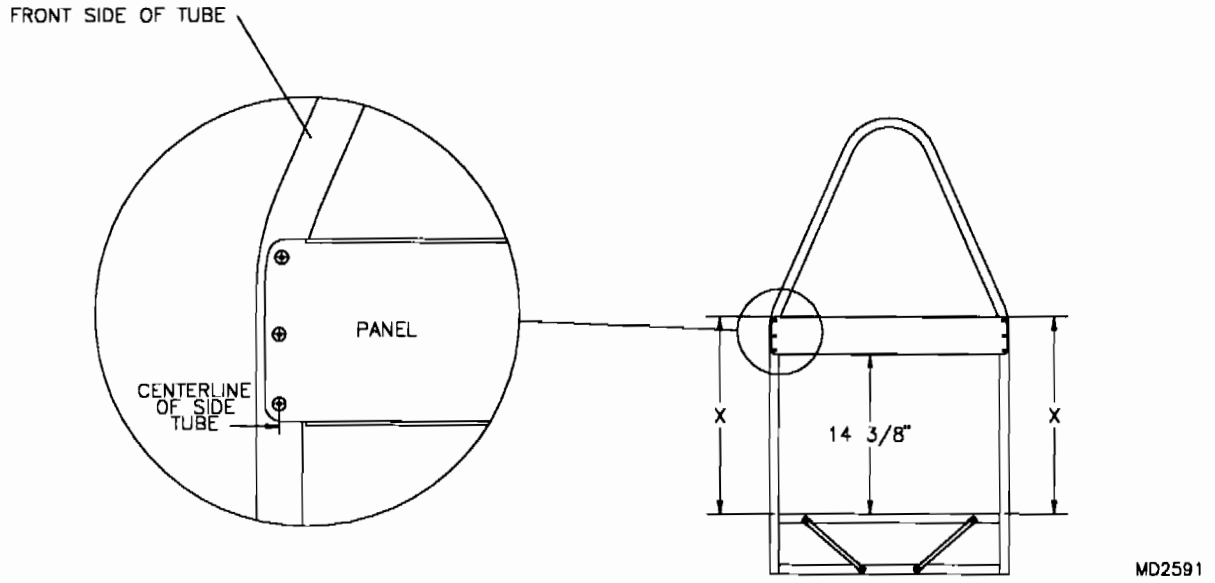
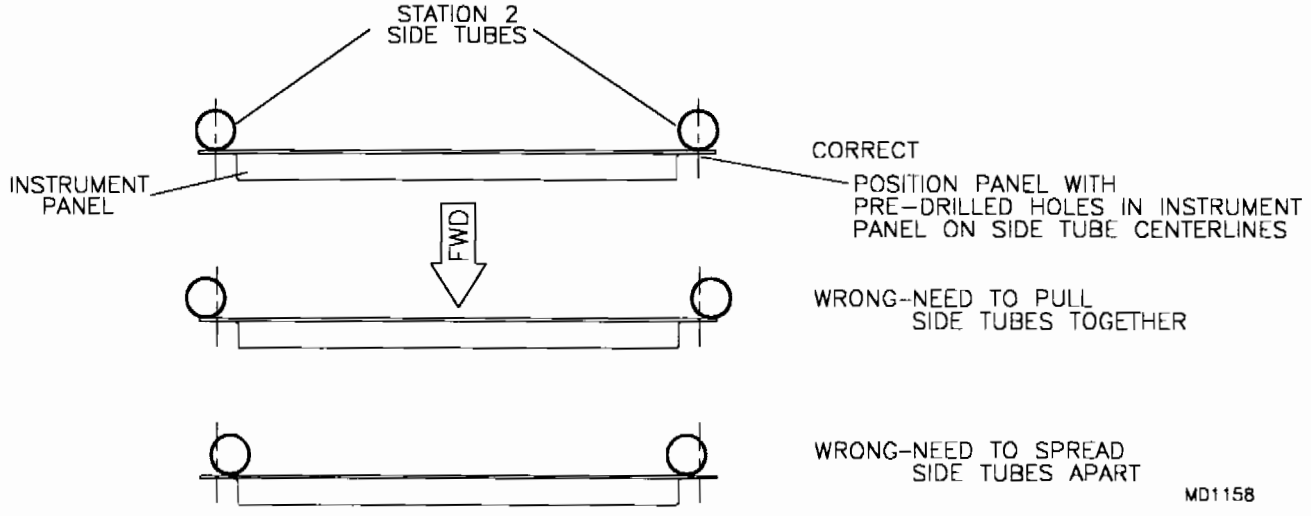


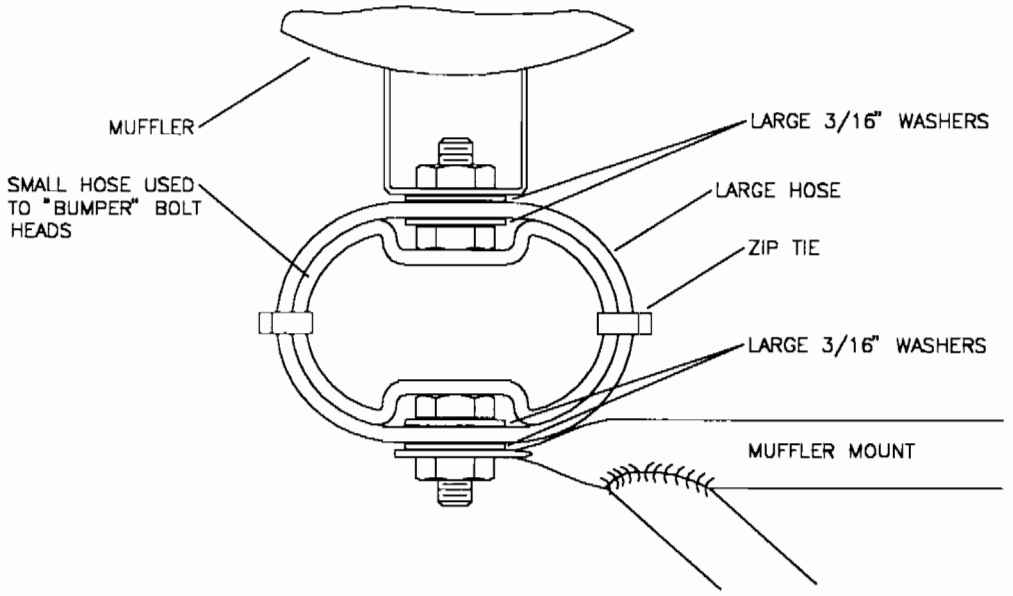
FIGURE 02-09A



This completes the assembly of station 2. Set this assembly aside and continue by assembling station 3. Refer to the station 3 assembly section.

10. Attach the muffler mount to the right side of the S-2 G-8. See the parts drawing. Do not tighten the bolts through the G-8. After the mount is attached to the S-2, assemble and attach the rubber mount as shown in **FIGURE 02-10**. Later we will install the muffler. It simply bolts to the rubber mount through the "U" bracket welded to the end of the muffler.

FIGURE 02-10



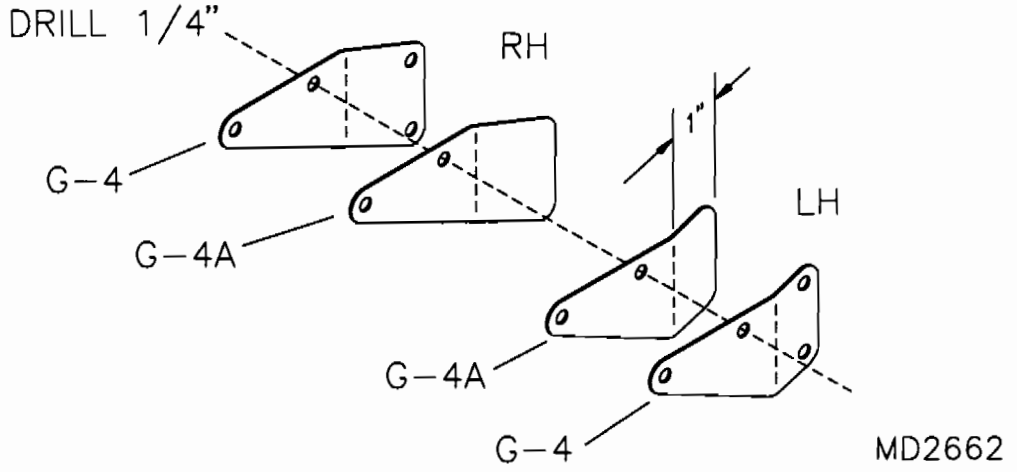
MD1158

S-3 ASSEMBLY

1. Assemble the top tube to the side tubes with the hardware shown in the parts drawing. When drilling through the top and side tubes, repeat as done with the S-2 assembly. Bolt as per the parts drawing. If you are installing doors, temporarily bolt the tubes together at this time. **NOTE**: If installing doors these bolts will need to be removed during covering.

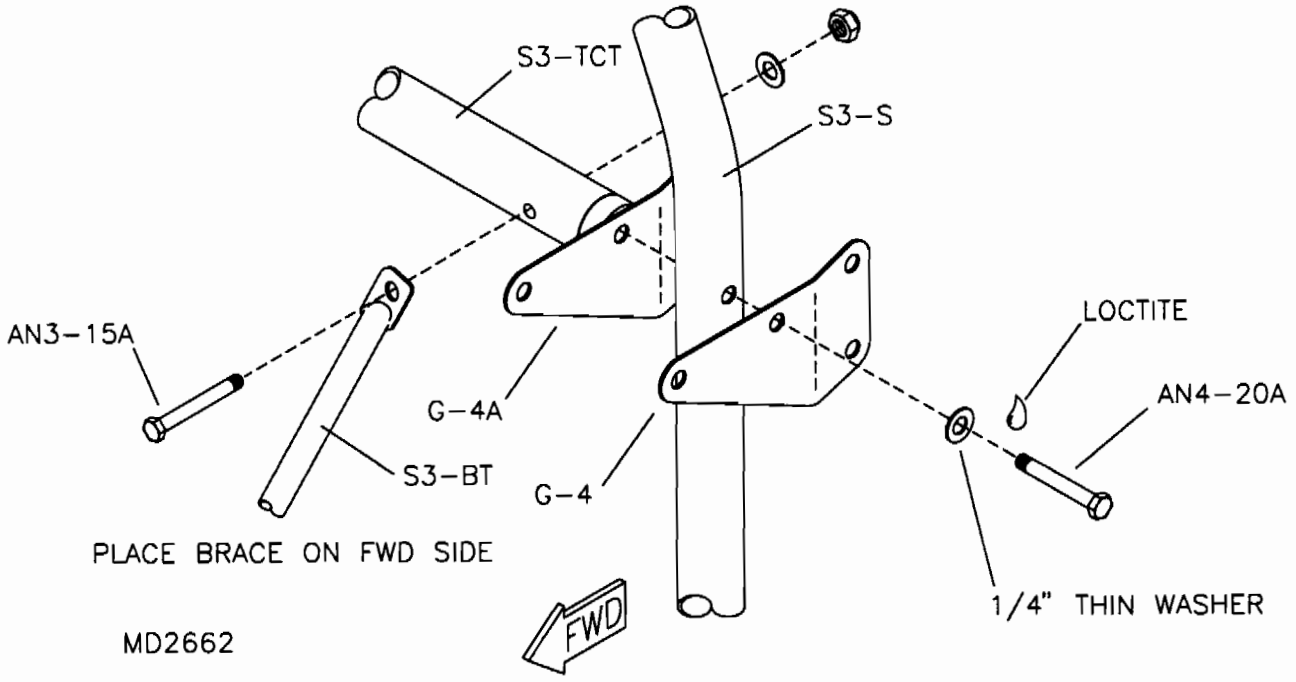
2. Select the two G-4 and G-4A gusset plates. Pair up the gussets as per **Figure 03-02.** Approximately 1" from the end, bend each of the gusset plates in 5 degrees. Be sure that you are pairing up the two different gusset plates. After bending, drill out the holes indicated to 1/4".

FIGURE 03-02



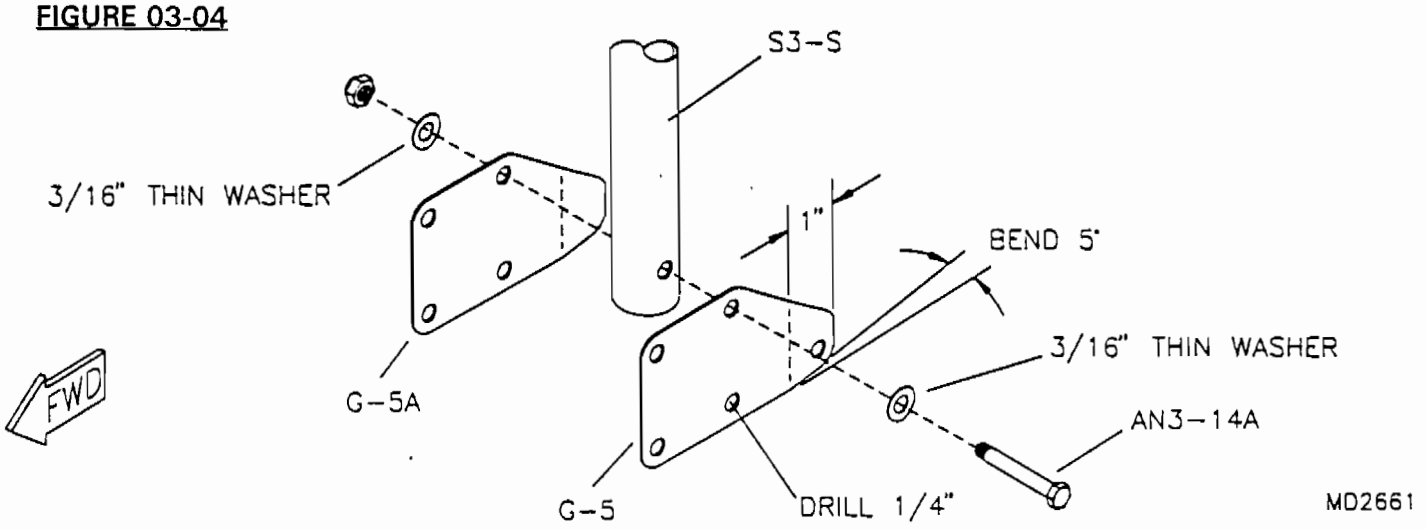
3. Assemble the S3 top cross tube to the side tubes. See **Figure 03-03**. Pay close attention to the direction of the gusset plates. When attaching the ½" tube diagonal brace, be sure to slip the AN3-15A bolt through the I-Nut inserted into the top cross tube on each side.

FIGURE 03-03



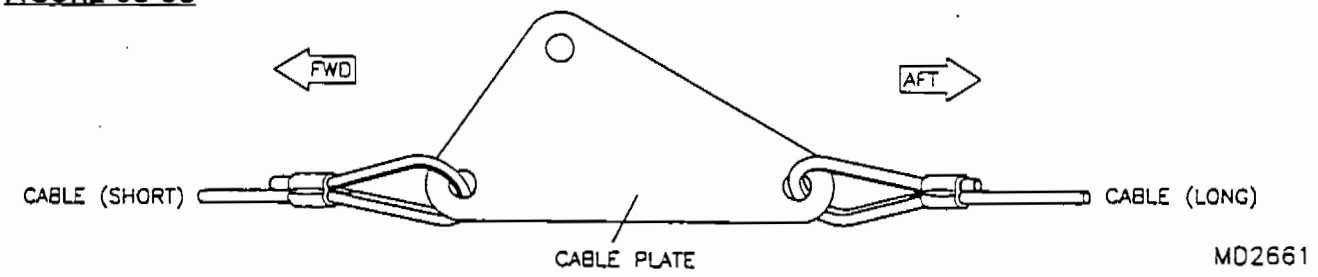
4. Select the two G-5 and G-5A gusset plates. Pair up the gussets like in **Figure 03-02.** Bend these gusset plates the same as previously done on the G-4 and G-4A gusset plates. Drill out the holes indicated to 1/4". Bolt as per **Figure 03-04**, with the 2-hole end facing forward.

FIGURE 03-04



5. Assemble the bottom cross tube to the side tube as per the parts drawing. **NOTE:** The vertical 3/16" bolt slides through the I-Nut on the bottom cross tube. Install the fuselage cables with the long end of the cable plate pointing aft. See **Figure 03-05.** Also, be sure to place the correct number of washers under and above the fuselage cables. For those building the **S-5 Trike** model, assemble the 2 attach angles to the bottom cross tube as per the parts drawing.

FIGURE 03-05



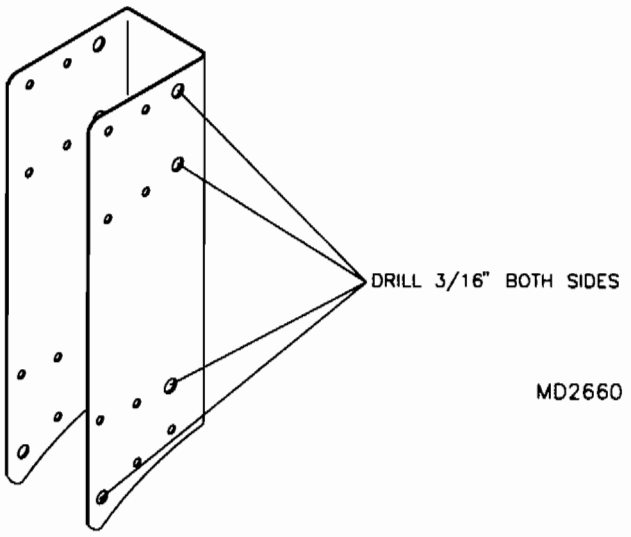
6. Position lower ends of ½" tube diagonal braces along forward side of bottom cross tube, per parts drawing. Using braces as guides, drill #11 holes on cross tube's centerline and rivet braces to cross tube. If building **S-5 Trike,** place the ½" tube diagonal brace on the inside of attach angles. **NOTE:** Braces should be installed after control stick assembly is installed to ensure that cross tube and attached pillow block remain properly positioned.

7. The dual teleflex retainer will be assembled after the control stick torque tube is installed.

S-5 ASSEMBLY

1. Drill out the holes indicated on both sides of the S-5 to 3/16" as shown in **Figure 03A-01.**
NOTE: The S-5 should be positioned with the straight edge to the top.

FIGURE 03A-01



2. The S-5 will be assembled along with the keel in the fuselage section.

S-4/5 FUSELAGE ASSEMBLY

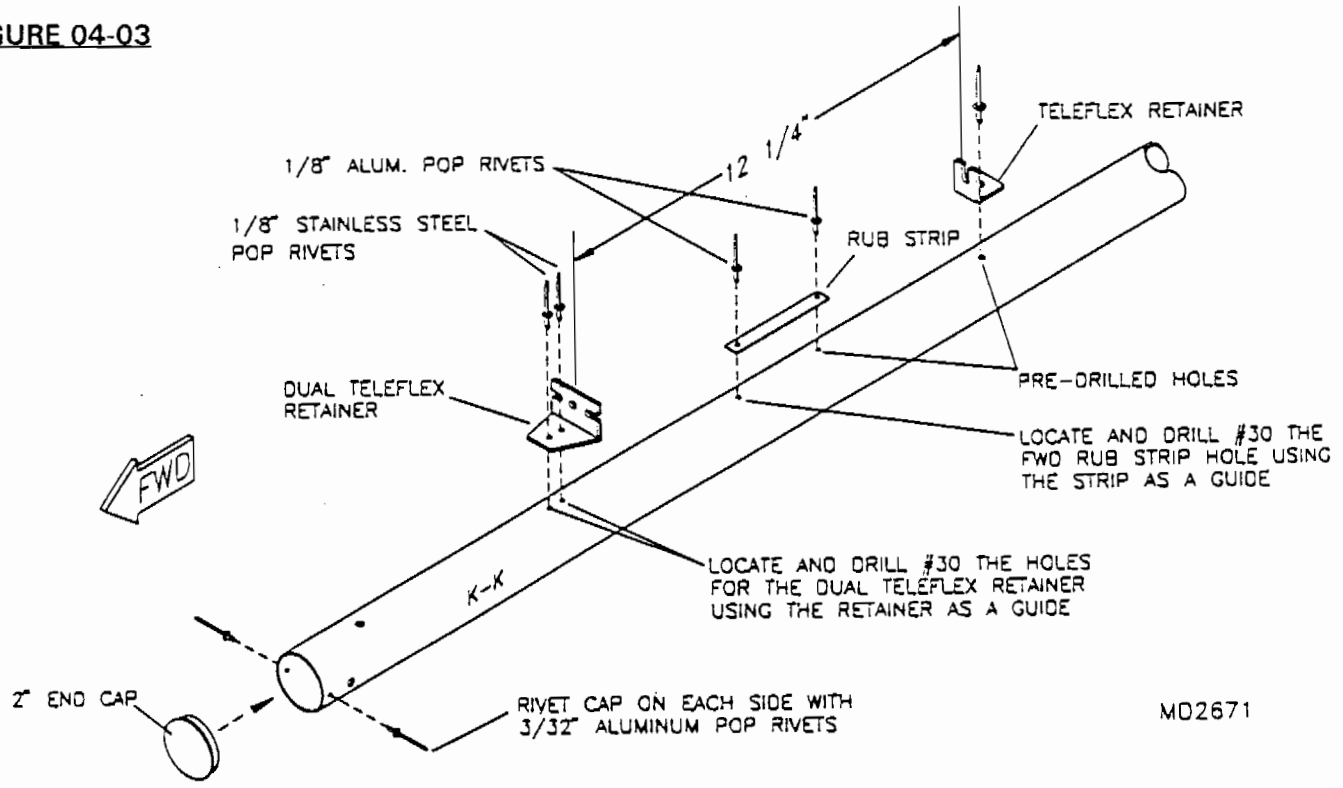
The method of construction using gusset plates and tubes is fast and simple ..... However, it is not very forgiving. It is advised that you double check that you are using the proper part as per the parts drawing. A temporary cleco could eliminate errors by allowing pre-assembly of much of the structure before committing it to rivets.

1. Select the parts depicted in the keel drawing.

2. Be sure to look over the keel closely to determine the correct sides. The parts drawing will assist you in determining which is the top and bottom. To determine the fwd and aft of the keel, the aft end will have the large hole in a vertical position. To determine top and bottom, the pre-drilled holes between stations 2 and 3 will need to be on top.

3. Install the 2" end cap on the fwd end of the keel and rivet. Rivet the teleflex retainer in the pre-drilled hole. Cleco the flap cable rub strip in the pre-drilled hole fwd of the teleflex retainer. Center the strip on the keel, drill and rivet. Remove aft cleco and rivet. Locate and drill the dual teleflex retainer to the location shown in **Figure 04-03**.

FIGURE 04-03

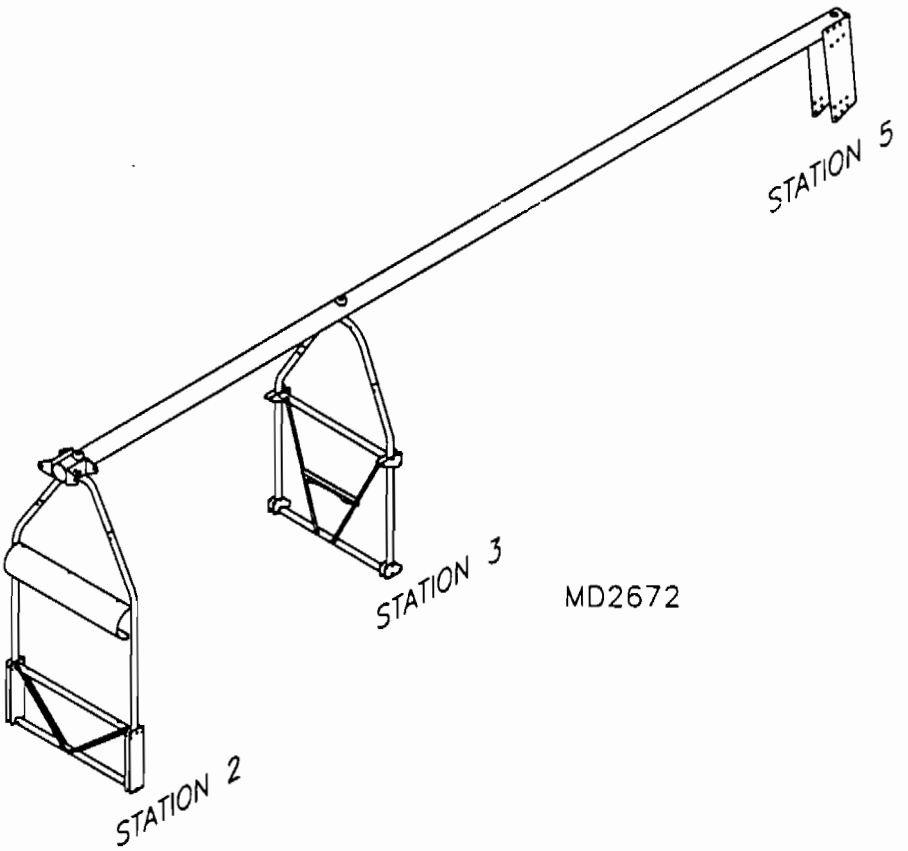


4. Assemble the S-5 to the aft of the keel as per the parts drawing. Attach the leading edge spar attach brackets to the keel; the trailing edge spar attach brackets will be installed after covering. **NOTE**: the attach brackets must be size-drilled to 5/16" to accommodate bolts.

5. Attach the S-2 and S-3 to the keel as per the parts drawing. **NOTE**: The S-4 is not to be attached to the keel at this time. See **Figure 04-05**.

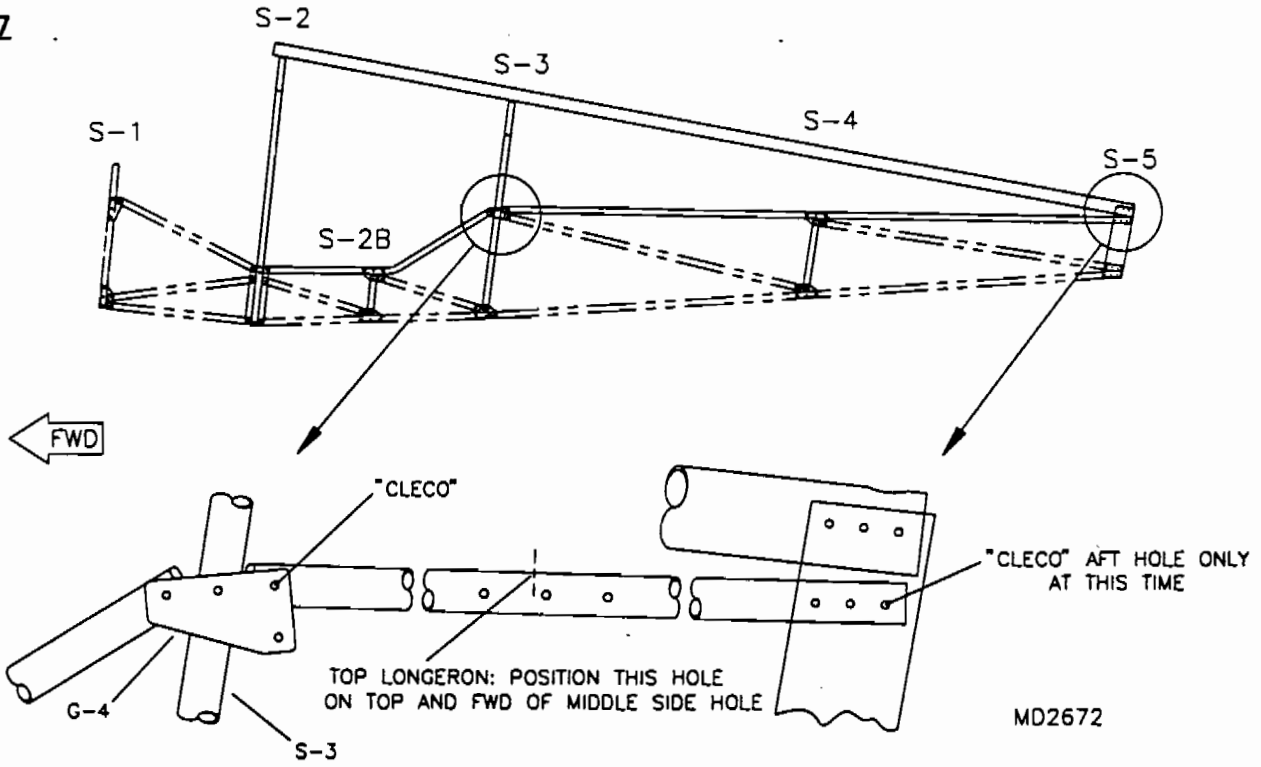
6. Lay out the two (2) tailcone top longerons and determine the fwd end by locating a single hole at 24 3/8" E.D. This hole goes on the inboard side. On the fwd end of both top longerons, drill a #40 hole on the bottom side and insert a 1" end cap and rivet in place.

FIGURE 04-05



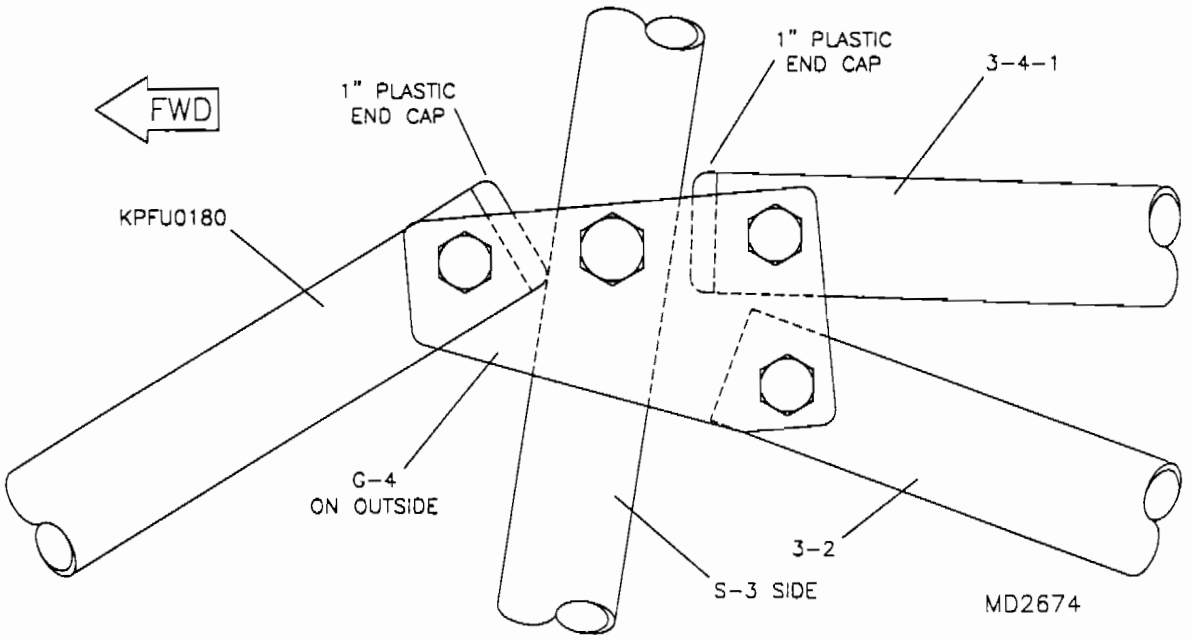
7. Drill to #11 the fwd hole and cleco the top longerons to the gussets on the S-3 and S-5 as per **Figure 04-07.**

FIGURE 04-07



8. Refer to the parts drawing (S1 - S3) to determine the aft end of the cockpit top longeron. Drill a #40 on the bottom side and rivet on a 1" end cap. Bolt the cockpit top longeron to the gussets as per the parts drawing. **IMPORTANT**: Make sure the cockpit top longeron is rotated into position against the S-3 side tube. See **Figure 04-08.**

FIGURE 04-08



9. Note that there is a forward and aft end to the aft cockpit bottom longeron. The forward end is distinguished by a doubler on the inside of the longeron positioned flush with the end. Note that there is also an internal doubler located at the middle set of holes. Verify that both of these doublers are in place. If not, contact the factory. Chase drill the hole that is located approximately 15/16" from the forward end of the tube to 1/4". When installing the longeron, position it so this hole is vertical. Drill all other indicated holes out to 1/4" for the fwd nut plates. See **FIGURE 04-09**. Bolt on both sets of the nut plates and position them so they are centered on the longeron and mark the holes at this time. Remove the aft nut plate and position the tailcone 7/8" connect into the aft cockpit bottom longeron as shown in the parts drawing. **NOTE**: Be sure the aft of the connectors point inboard and the aft hole in the bottom longeron is in line with the hole in the 7/8" connector. See **FIGURE 04-09**. Cleco the aft hole of the bottom longeron and the 7/8" connector. Transfer drill the fwd hole out to 1/4" and cleco. Remove aft cleco and transfer drill to 1/4". Drill the 3/16" hole for the nut plate through the 7/8" connector. Drill a #40 on the previously marked nut plate holes and rivet all the nut plates. **NOTE:** The tail hook (trike models only) will be installed after covering. Use a pointed soldering iron to locate and install. Bolt the bottom longeron to the S-3 as per the parts drawing. See **FIGURE 04-09A**. **NOTE**: Loctite the aft bolt before installing. Bolt the bottom longeron to the S-2 gusset plates as per the parts drawing.

FIGURE 04-09

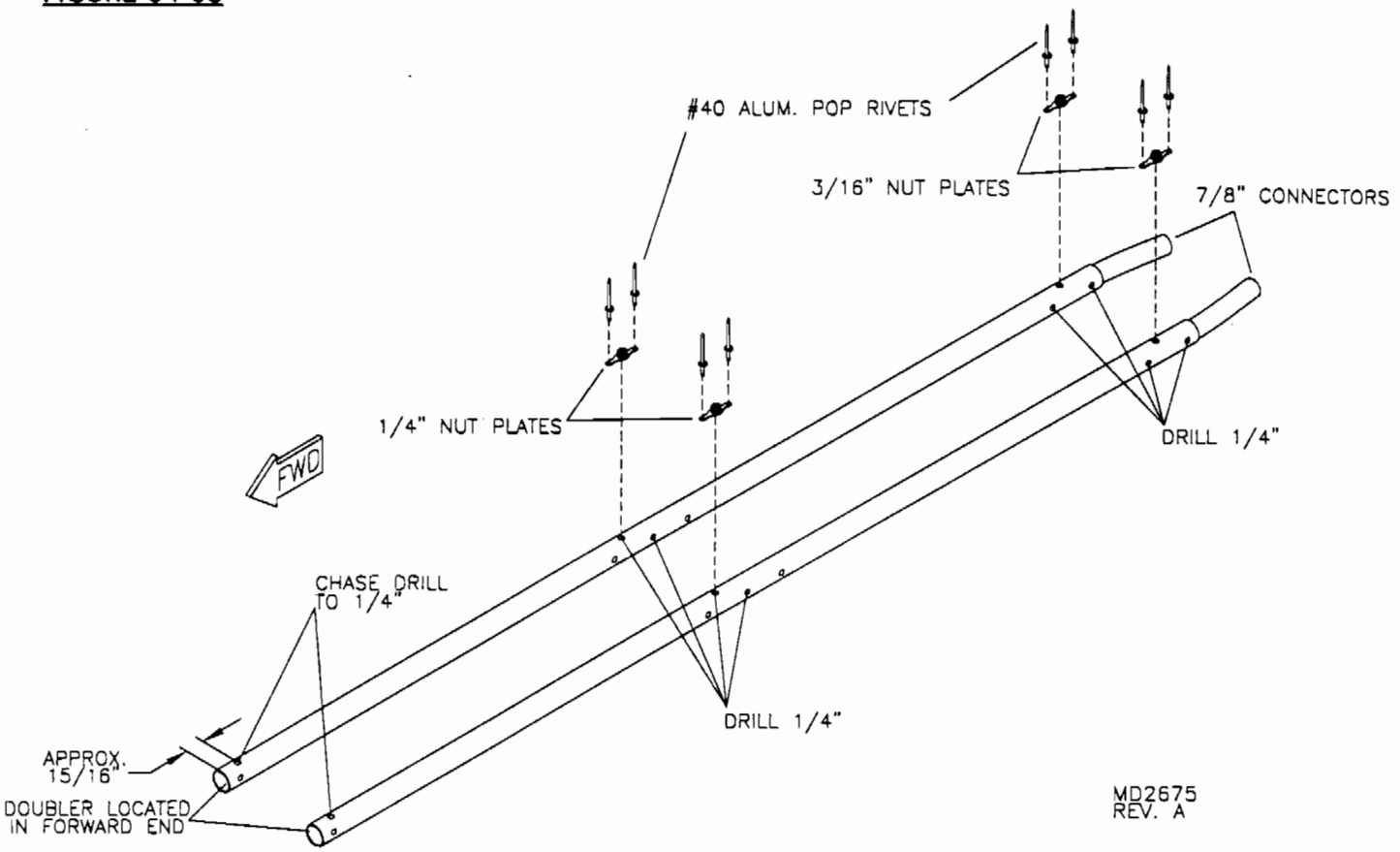
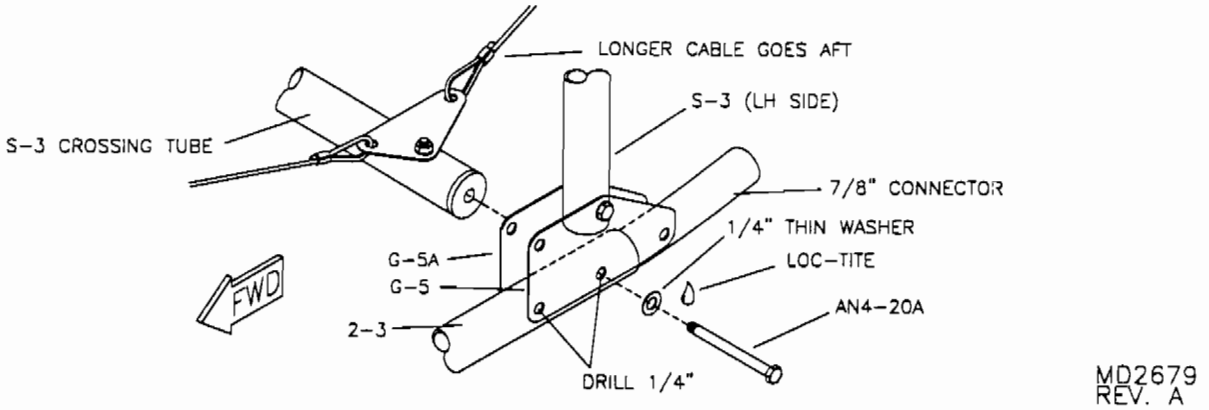
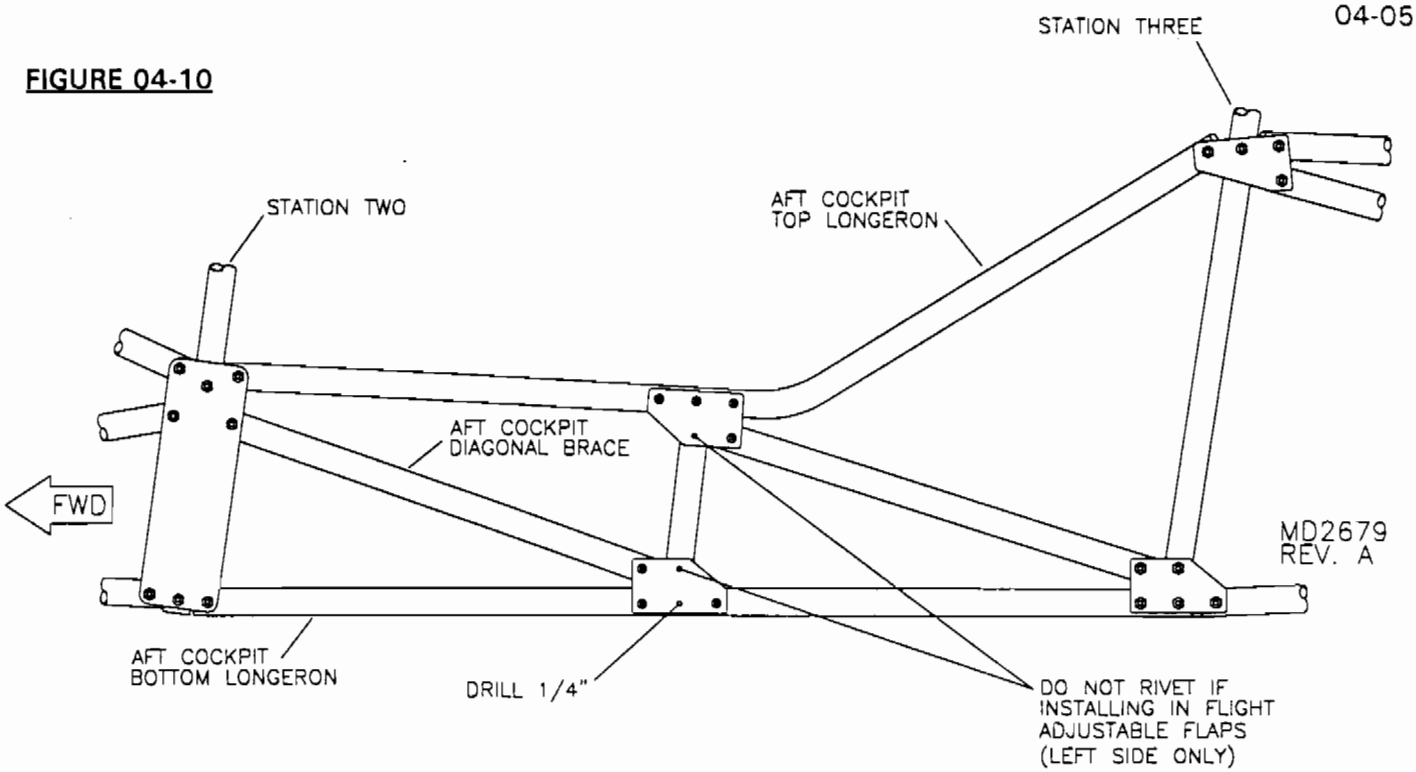


FIGURE 04-09A



10. Rivet and bolt the vertical brace tubes and diagonals in place as per **FIGURE 04-10** and the parts drawing. **NOTE:** If you are installing the in flight adjustable flaps the left hand vertical brace tube will be installed with bolts rather than rivets. Refer to the in flight adjustable flap section.

FIGURE 04-10



11. Select the parts depicted in the station 2B parts drawing and assemble as per the drawing. On the S-5 trike version, install the attach angles on the fwd side of the bottom crossing tube. Drill out the gusset plates to 1/4" and bolt as per the parts drawing. Install the rivets on the right hand side as per the parts drawing.

12. Cross the fuselage cables over the S-2B crossing tube and attach to the S-2 as per **FIGURE 04-12** and **FIGURE 04-12A**. The cables will be fine tuned later in this section.

FIGURE 04-12

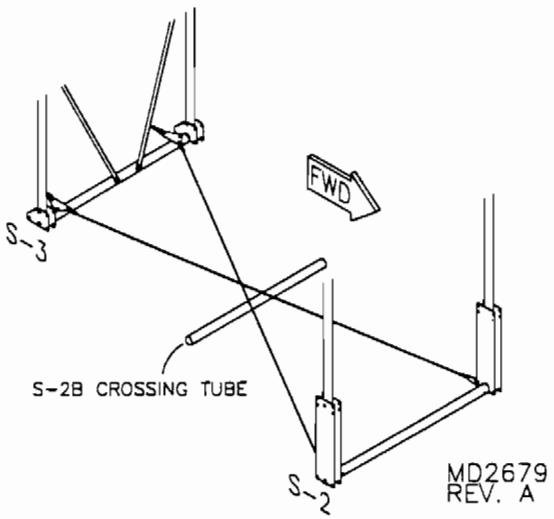
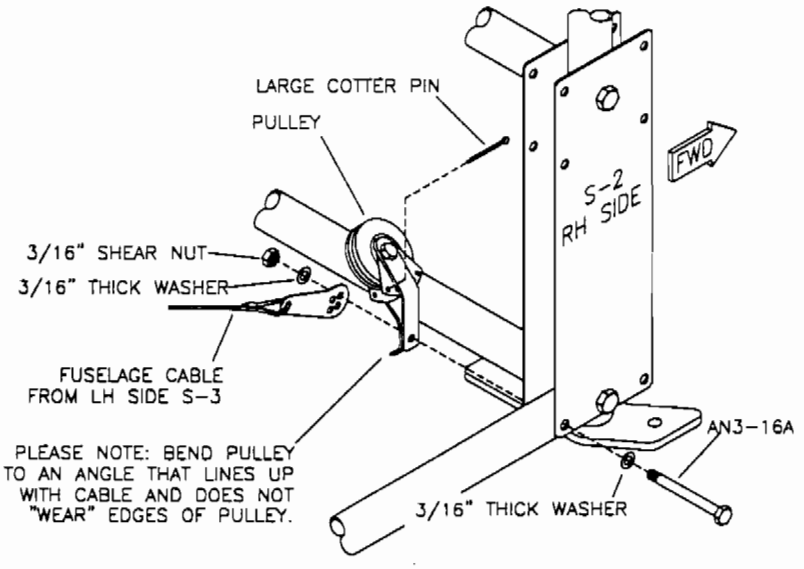


FIGURE 04-12A



13. Lay out the (2) bottom longerons and position them as shown in **FIGURE 04-13**. Drill out and rivet the 1/4" nut plates as in **FIGURE 04-13**. Insert the fwd end of each longeron into the S3-7/8" connector. **NOTE:** Insert with the nut plates on the top side and the right and left longerons in their

respective locations. Push the longeron into the connector until the gusset hole and the longeron hole align. Transfer drill through the bottom longeron using the G-5 gusset as a guide. See **Figure 04-13A.** **NOTE:** When drilling be sure that the longerons stay horizontally in line as you drill straight through. **HINT**: Use a block of wood with a hole drilled in a drill press as a drill guide. Bolt as per the parts drawing.

FIGURE 04-13

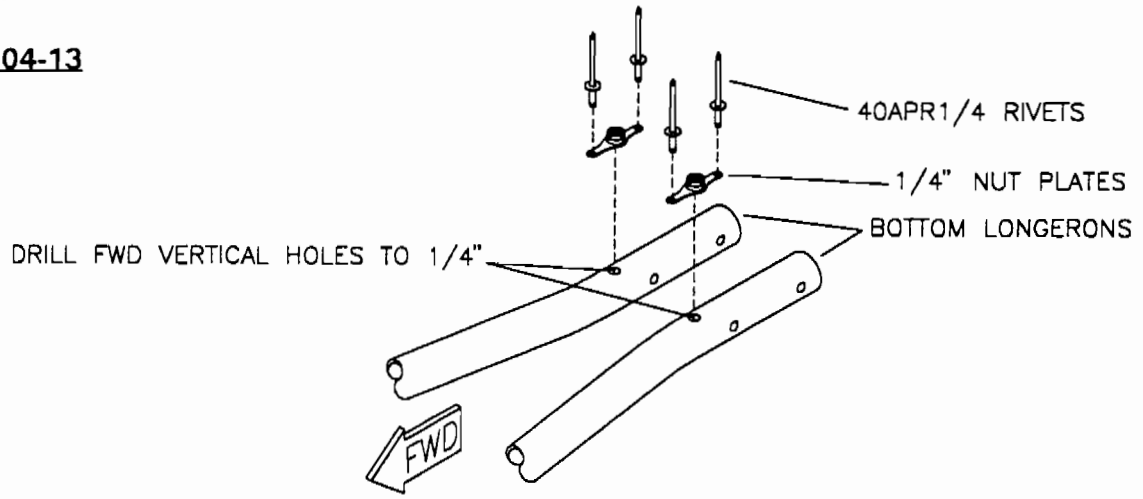
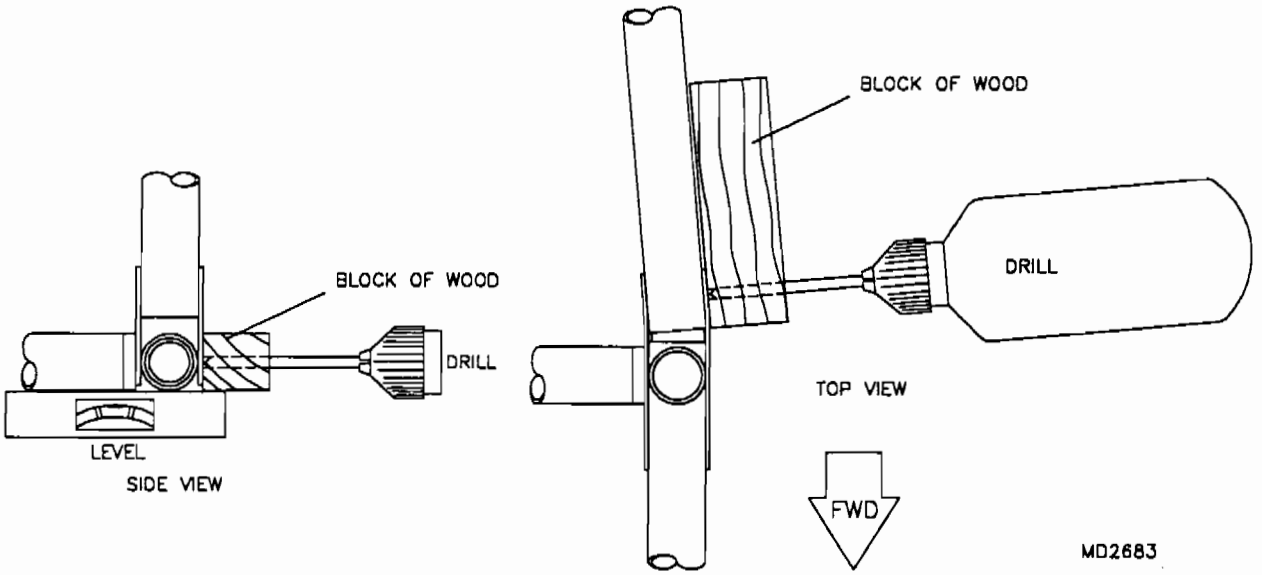


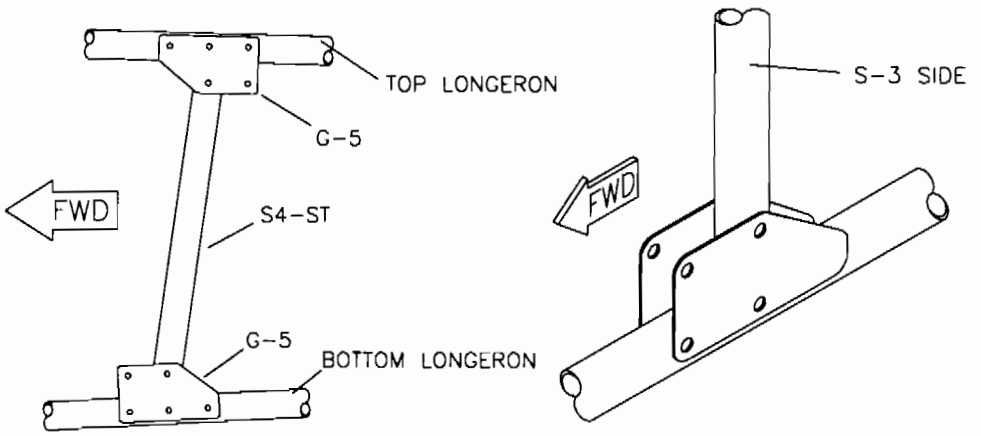
FIGURE 04-13A



14. With the fwd end of the bottom longerons bolted, slide the longerons into the S-5. Bolt in the pre-drilled hole as per the parts drawing. At this time just hand tighten this bolt, it will be unbolted later to bend the hummertangs.

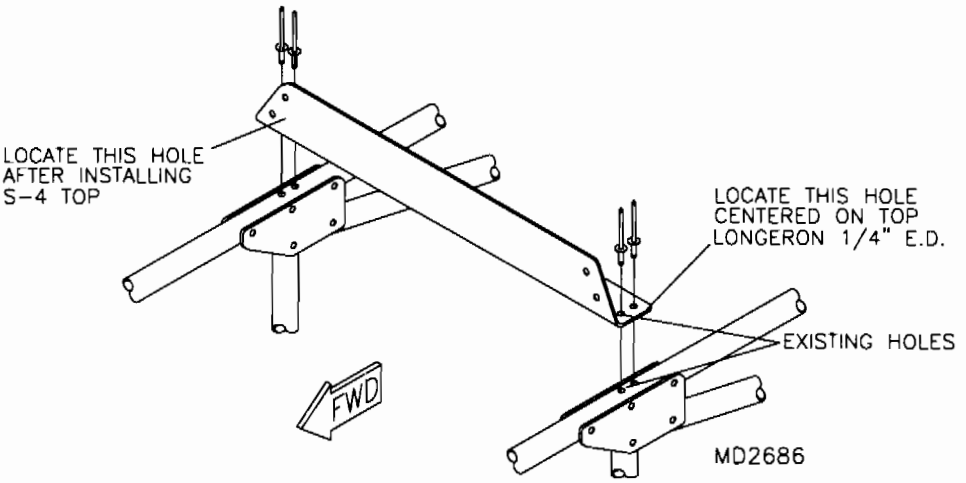
15. Cleco the (6) G-5 and (2) G-5A gusset plates to the longerons at the S-4 location in the pre-drilled holes. Be sure not to cleco the inside bottom aft hole. These are to be used to attach the belly cables in a later step. See **Figure 04-15**. Cleco on the S-4 side tubes as in **Figure 04-15**. Rivet the S-4 top crossing tube to the top longeron as in **Figure 04-15A**. Rivet the fwd hole and transfer drill the aft hole. After attaching the top crossing tube rivet on the top tube as per the parts drawing. See **Figure 04-15A**.

FIGURE 04-15



MD2684

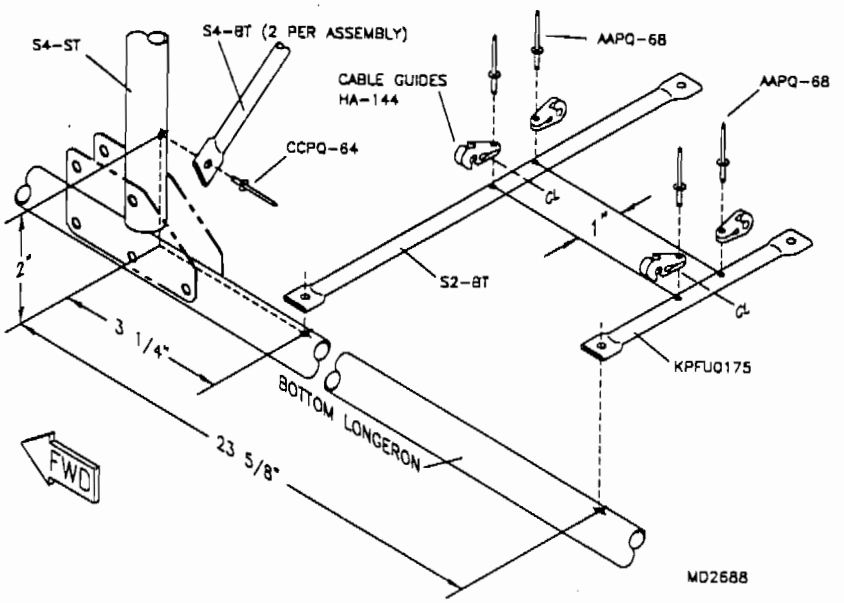
FIGURE 04-15A



MD2686

16. Locate and drill the 3/16" holes for the cables guides on the fwd and aft ½" brace tubes. See **Figure 04-16**. Rivet as per the parts drawing. After installing the guides, rivet the brace tubes to the bottom longeron. See **Figure 04-16** for the locations to drill and rivet the brace tubes on the bottom longeron.

FIGURE 04-16



17. Cleco the fwd and aft tailcone diagonals. Drill and bolt on the fwd tailcone diagonal prior to clecoing it on the S-4 gussets. For the aft tailcone diagonal, cleco the S-4 gusset first and then onto the S-5.

18. Inspect the tailcone for alignment. The S-5 should line up vertically with the S-3 looking from the S-5 fwd. If there is vivid misalignment, it is possible a gusset plate is in backwards or you may have used a wrong tube. If this is not the problem and you are only slightly off, twist the tailcone into the alignment. When happy with the alignment, remove the clecos and transfer drill the remaining and existing holes to a #11 and rivet the S-5 as per the parts drawing.

NOTE: The most common reason for tailcone misalignment is uneven insertion of the bottom longeron into the S3-7/8" connecting tube. Remember the longeron's pre-drilled hole must match with the S-3's lower gusset plate.

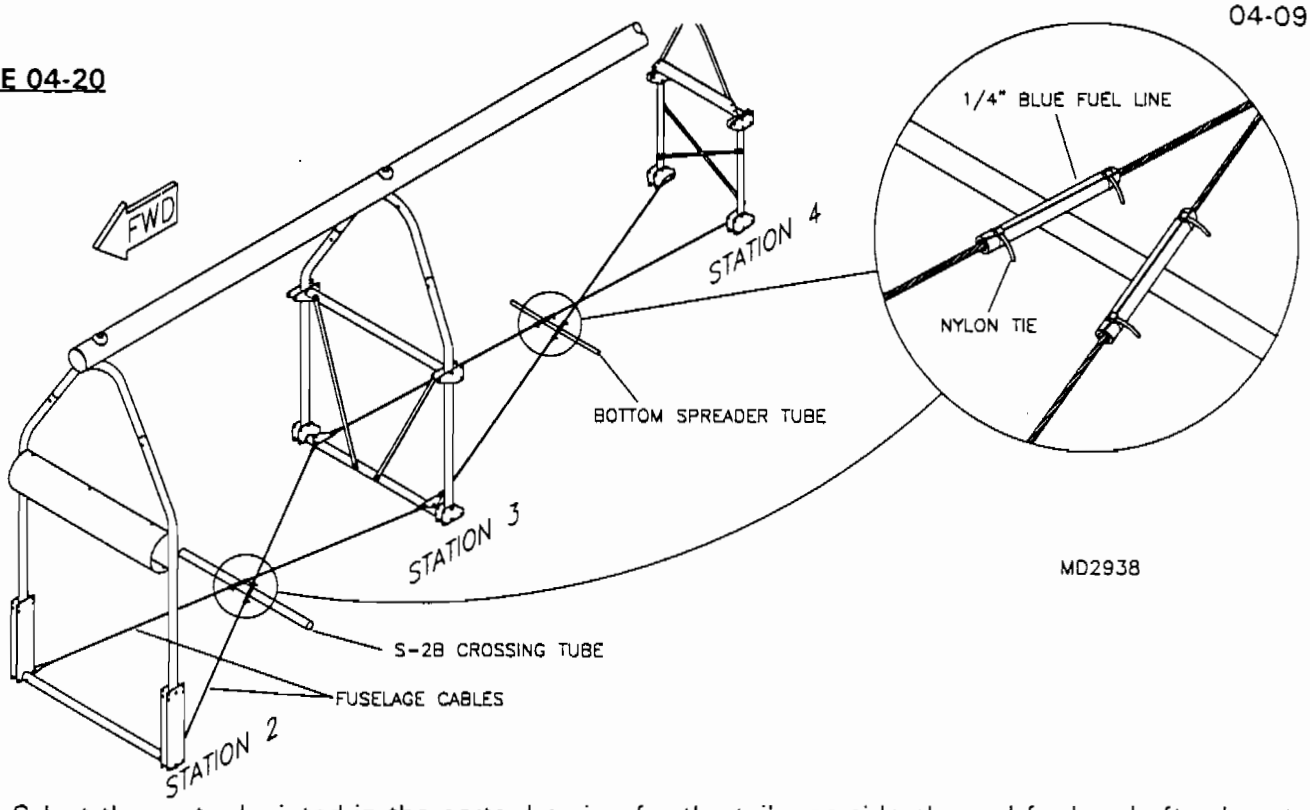
Double check the S-4 assembly. All rivets should be in place with the exception of the rivet on the inside aft hole of each G-5. Check rivet quality. They should be driven with heads flat and no gaps between the plates and tubes.

19. Measure, mark, center punch and drill to #11 the bottom holes in the S-4 side tubes. See **FIGURE 04-16** for the proper locations and cleco. The diagonal ½" tube braces will need to crisscross, one on the fwd side of the side tubes; the other aft. Once the diagonal braces are fastened to the bottom holes, center them on the opposite top of the S-4 side tubes and drill and rivet. Use stainless steel rivets on all locations of the S-4 unless otherwise noted.

20. Check for the squareness of the cockpit by measuring diagonally across the bottom of the bay between the S-2 and S-3. If it is not square, adjust the fwd fuselage cables. The cables can be shortened or lengthened by twisting. The aft fuselage cables must be used to fine tune the center line alignment of the fuselage. Eye down the length of the keel tube if it curves to the left or right tighten the proper cable to bring it into alignment. If tweaking the cables fails to straighten the keel, the cause may be the S-4 top tube. It is acceptable to file the top tube with a side slot to correct the misalignment. Once alignment and tension are achieved, cross the rear fuselage cables and rivet to the remaining holes on the lower G-5 gussets at the S-4. See **FIGURE 04-20** for fuselage cable orientation.

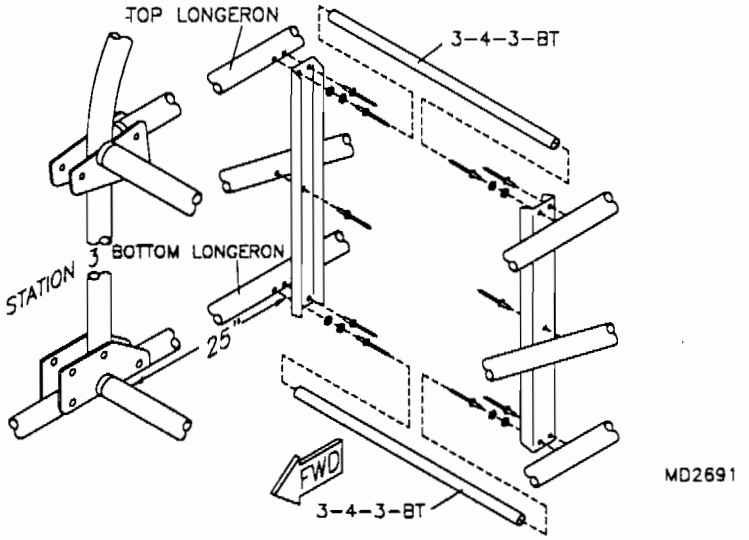
Take the 2 pieces of blue fuel line on the S-2B parts drawing and cut in half. Slit each piece down it's length and slip over the cables where they cross over the S-2B crossing tube and the bottom spreader tube. Zip tie the ends to secure in place. See **FIGURE 04-20**.

FIGURE 04-20



21. Select the parts depicted in the parts drawing for the tailcone side-channel fwd and aft. Locate the pre-drilled holes that are approximately 25" aft of the S-3 and cleco the fwd hole of the fwd tailcone channel into the top and bottom longeron at this point. See **FIGURE 04-21**. Transfer drill the remaining holes of the channel into the longerons and fwd tailcone diagonal. Rivet as per the parts drawing. Be sure to install the two 3/16" thick washers under the rivets on the fwd side of the channels. Insert the spreader tubes over the rivet "buttons" by slightly spreading the longerons apart. You may need to trim the spreader tube to fit. Eye down each longeron. They should be straight at the spreader tubes and not bowed out. Cleco the tailcone side-channel aft in the same manner as the fwd channel in the pre-drilled holes that are 25" aft of the S-4. Transfer drill and rivet the remaining holes of the aft channels. Remove the top forward clecos and install the washers and rivets (buttons). Refer to the parts drawing. Remove the bottom forward clecos and rivet. Measure the distance between the longerons at the buttons and fabricate the aluminum compression tube. Refer to the parts manual. Install the compression tube between the buttons. Note that it may be necessary to bevel the inside of the compression tube to allow it to fit over the buttons. The compression tube should fit snug without distorting or bowing the longerons.

FIGURE 04-21



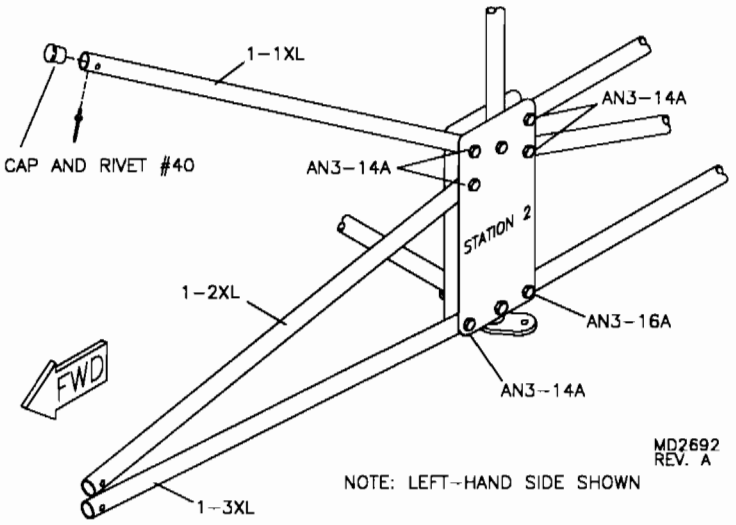
22. Inspect the tailcone once more for loose or improperly set rivets and/or missing rivets.

Fuselage Assembly S-2 to S-1

23. Select the parts depicted in the parts drawing for the S-2 to S-1.

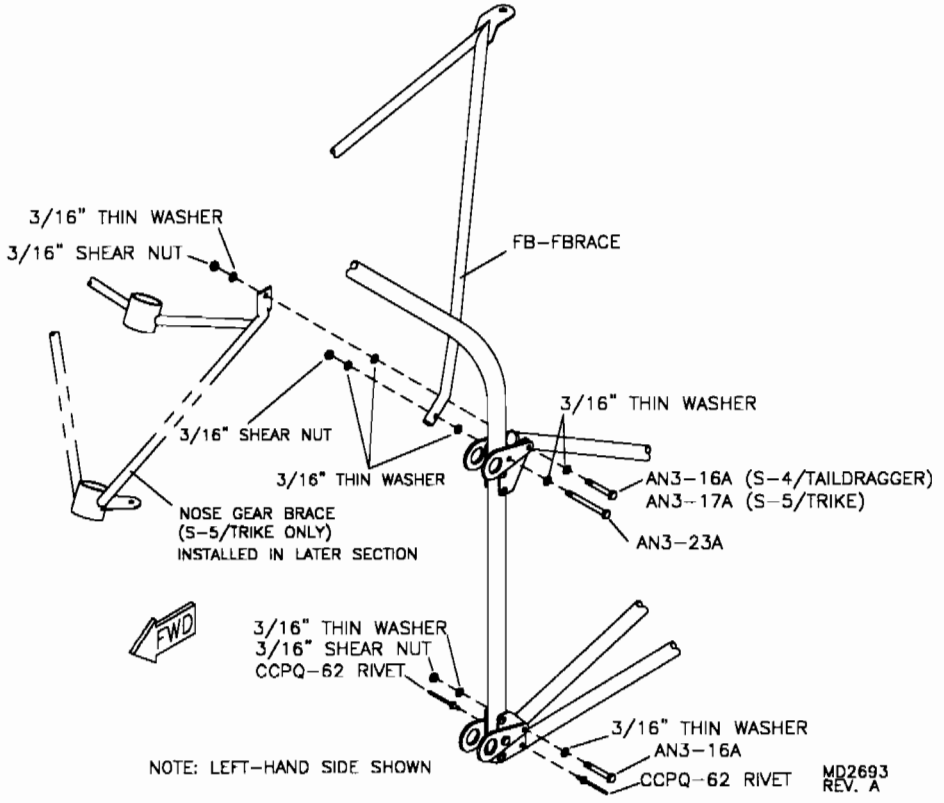
24. Drill a #40 hole and rivet the 1" end cap into the fwd end of the fwd cockpit top longeron. Install the fwd cockpit top longeron on the S-2 and bolt with the supplied hardware. Then bolt the remaining tubes to the S-2 as per **FIGURE 04-24**. **NOTE:** The fwd cockpit top and bottom longeron have their notches facing up against the S2-ST.

FIGURE 04-24



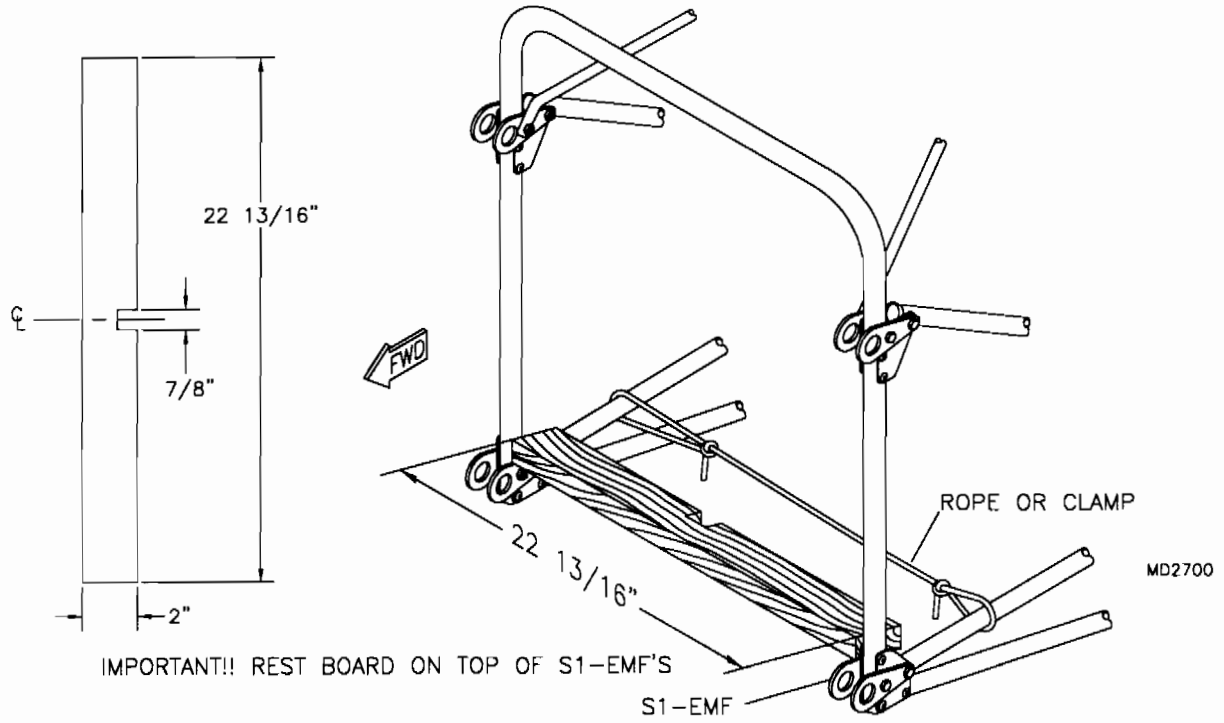
25. Attach the pre-assembled S-1 to the fuselage as per **FIGURE 04-25**. **PLEASE NOTE:** The nose gear internal brace shown in **FIGURE 04-25** will be installed later in the nose gear section. Install the FB-BRACE on the S-1 as per **FIGURE 04-25**.

FIGURE 04-25



26. Fabricate a rigging board as shown in **FIGURE 04-26**. This will be used to set the bottom spacing on the S-1. Take a bar clamp or a length of rope and position the rigging board as shown in **FIGURE 04-26**. **IMPORTANT:** Be sure to rest the board on **top** of the S1-EMF's. **NOTE:** Save this rigging board to be used later when setting up the ailerons in a later section.

FIGURE 04-26

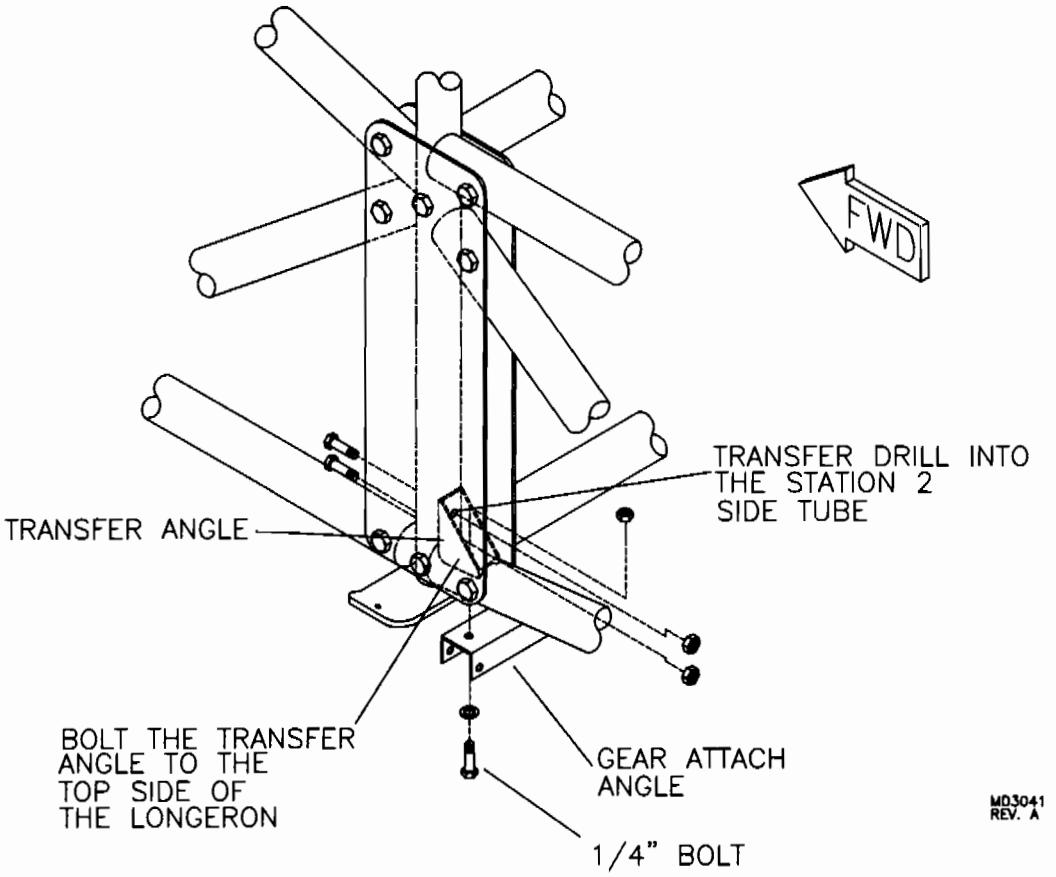


27. At this time the fuselage section is complete. Although, the next 2 sections will be used to align and square up the fuselage. Inspect the fuselage for loose nuts and improperly set rivets. Correct as required.

S-4 TRANSFER ANGLE INSTALLATION

1. If not already done so, chase drill the forward vertical hole in each aft cockpit bottom longeron to 1/4". Bolt the transfer angles to the top sides of the forward ends of each longeron. Note the orientation of the angles. Refer to the parts drawing. Using a #11 drill bit, transfer drill through the two pre-drilled holes in the vertical leg of the transfer angle into the station 2 side tube and bolt in place. Refer to **FIGURE 04-01**.

FIGURE 04-01



S-4/5 COYOTE FIREWALL

1. Smooth the edges of the sheet aluminum firewall with a file or 350 grit sandpaper. Debur the (3) 7/8" holes and starter pulley slot.

2. Set the firewall on the S-1 to check fit. The top windshield flange should have about 1/16" gap clearance between the S-1 for the windshield insertion. The sides should be set to overlap the S-1 evenly. The entire firewall should appear to fit square on the S-1. When happy with the fit, drill and cleco with #30 rivets the firewall to the S-1. Refer to **Figure 05-02**. If no starter is to be installed, fabricate a starter cover from the raw stock and rivet to firewall, see **Figure 05-02A**.

FIGURE 05-02

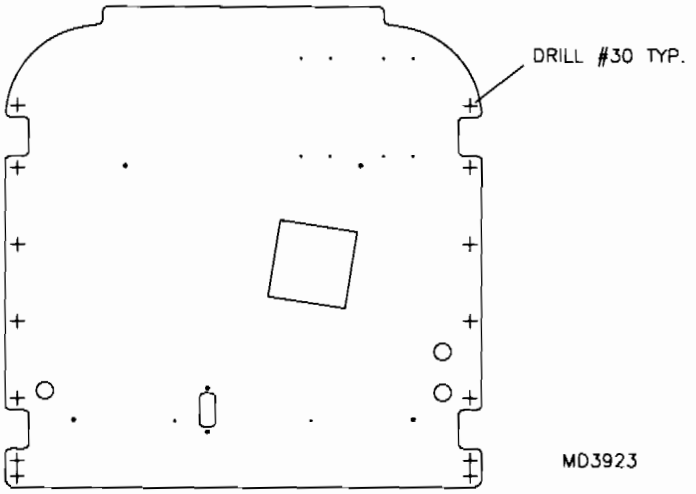
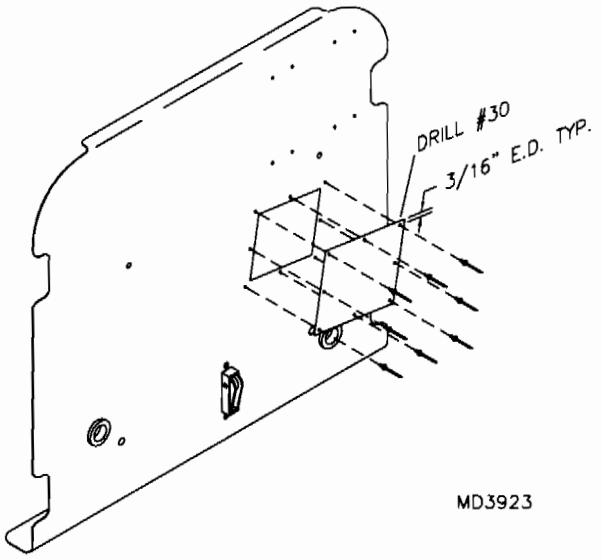
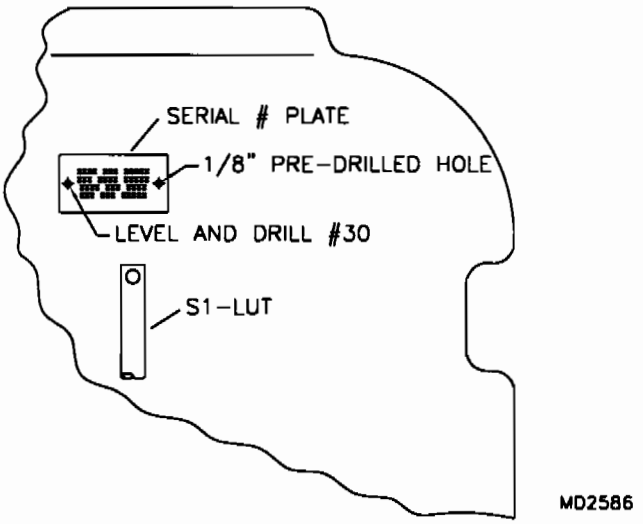


FIGURE 05-02A



3. With firewall clecoed in place, drill through the (4) 3/16" nut plates from the back with a #30 bit, then from the front with a #11. *Avoid damaging nut plates!* Locate serial number plate as shown in parts drawing, riveting plate's right side to hole provided in firewall; drill and rivet plate's left side. See **Figure 05-03**. *NOTE: If Rotax 503 is to be installed, this space will be occupied by an oil tank; locate plate on corresponding left side of firewall.*

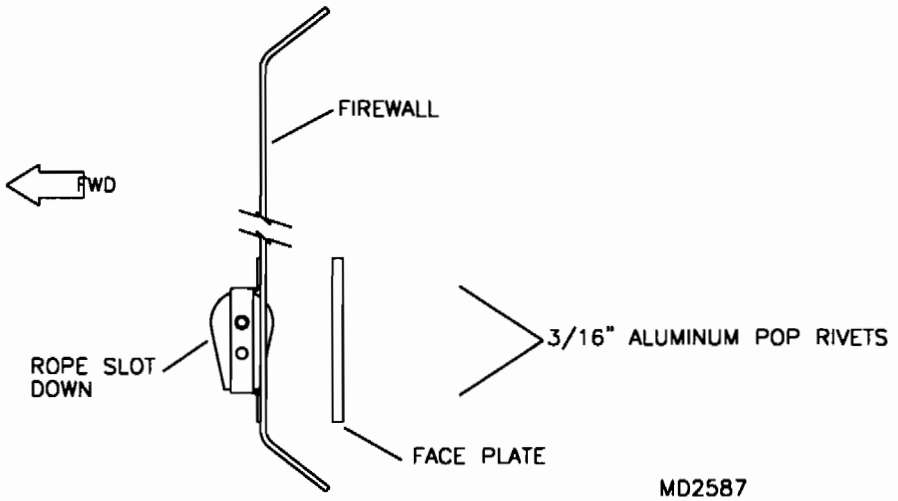
FIGURE 05-03



4. Un-cleco firewall, remove shavings and debur holes. Apply soundproofing to firewall with the black fabric facing inside, against the S-1; this may be applied with spray adhesive. Once soundproofing is applied, use a razor blade to trim off excess soundproofing. Use a hot knife to cut the slot for the starter pulley and the 3 rubber grommet holes. A ice pick works nicely to poke through the soundproofing on any drilled holes.

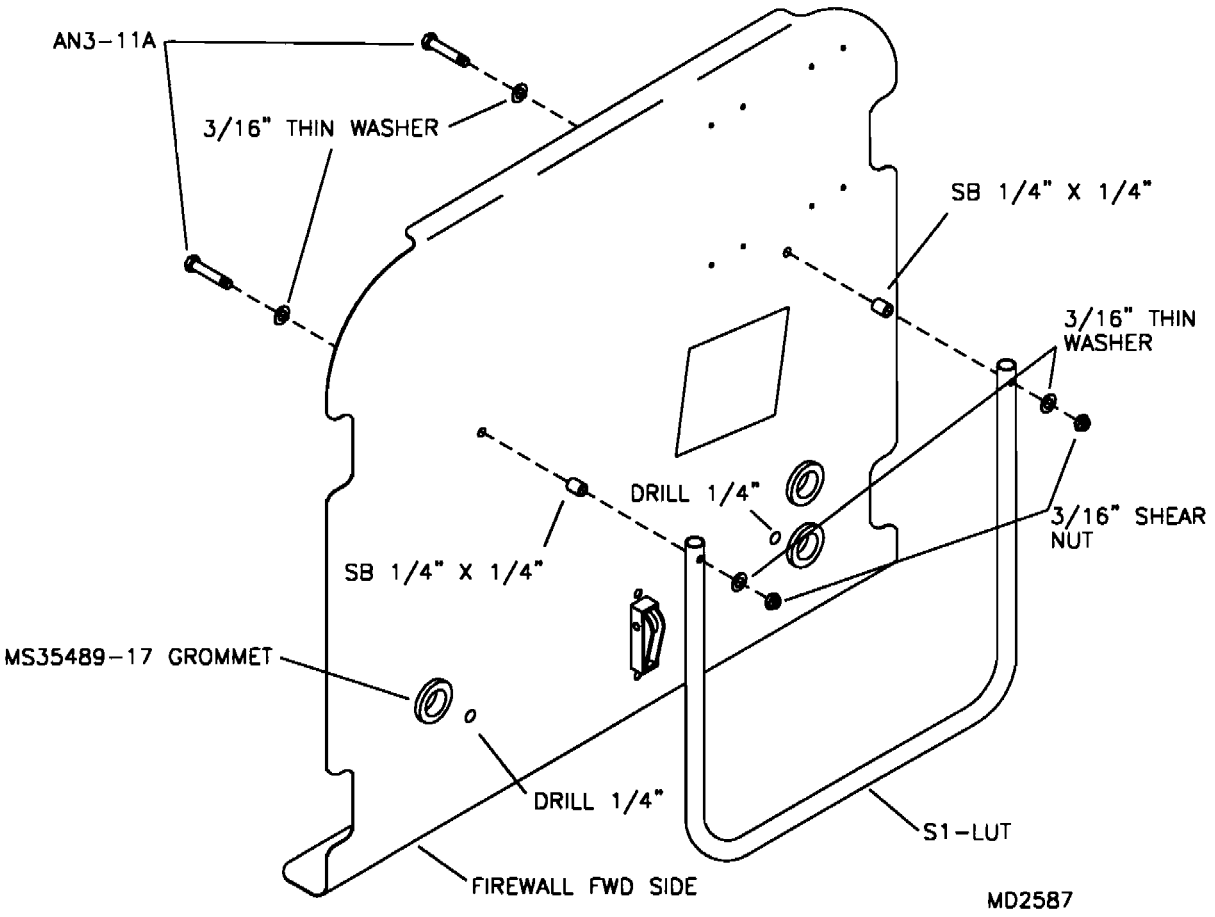
5. Drill and cleco the starter pulley to the firewall using the pulley tabs as drill guides. See **Figure 05-05**. Make sure the pulley is positioned with the face plate on the firewall's backside and the pulley extending on the front side.

FIGURE 05-05



6. Attach the lace up tube to the firewall using the hardware shown in **Figure 05-06**. Next, insert the 3 rubber grommets into the holes provided. Be sure to slide the soundproofing inside the grommet flange.

FIGURE 05-06



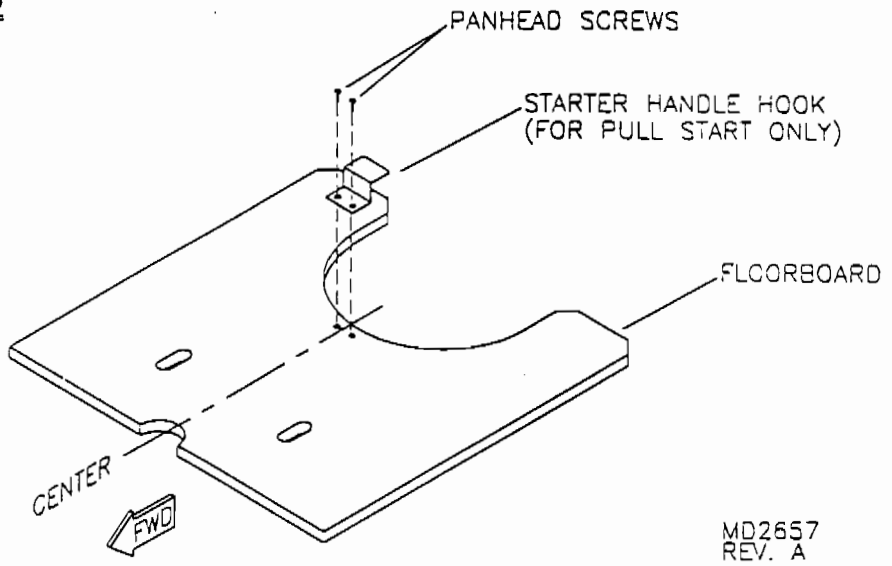
7. Finally, rivet the firewall to the S-1 with the hardware shown in the parts drawing.

S-4 & S-5 FLOORBOARD & RUDDER PEDAL INSTALLATION

1. Select parts depicted in parts drawing for floorboard and rudder pedals. Floorboard is sealed on upper side only; if you wish to seal bottom side, do so prior to assembly.

2. Locate and mark the centerline of the floorboard. If you are **NOT** installing the electric starter option, attach the starter handle hook on centerline using the pan head screws provided. Position the hook so that it is flush with the edge of the floorboard. See **FIGURE 06-02.**

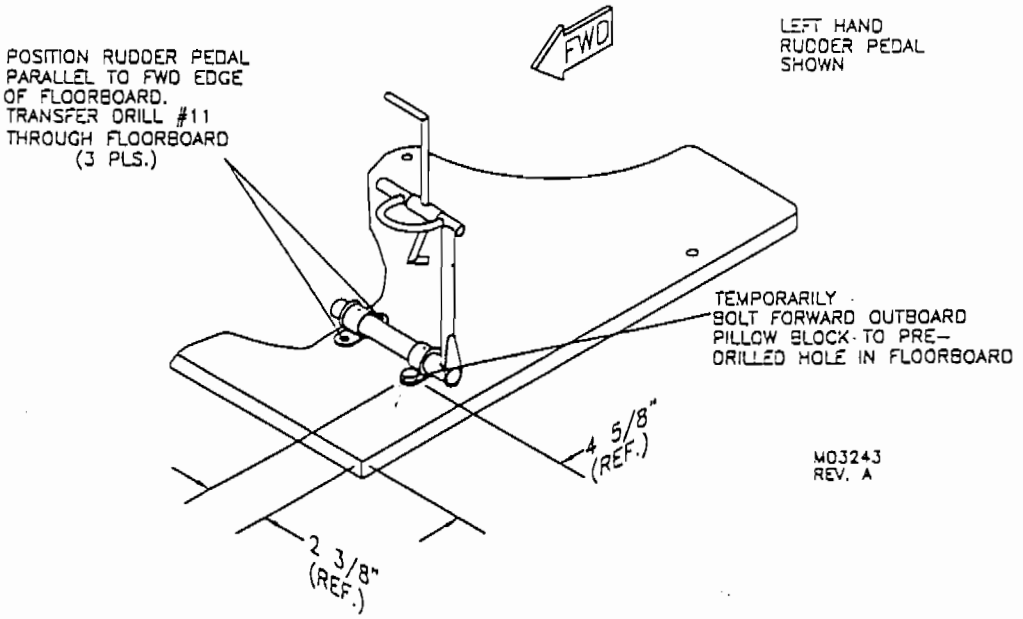
FIGURE 06-02



3. One locating hole is pre-drilled in the floorboard for each rudder pedal. Refer to **FIGURE 06-03** for reference dimensions to the locating hole. Temporarily bolt each respective rudder pedal to the floorboard exactly as shown in **FIGURE 06-03**. Align the rudder pedals so that they are parallel to the forward edge of the floorboard. Using a #11 drill bit, transfer drill through the three remaining holes in the pillow blocks of each rudder pedal through the floorboard. Remove the rudder pedals and press the Tee Nuts into each hole in the floorboard from the bottom side. Refer to the parts drawing.

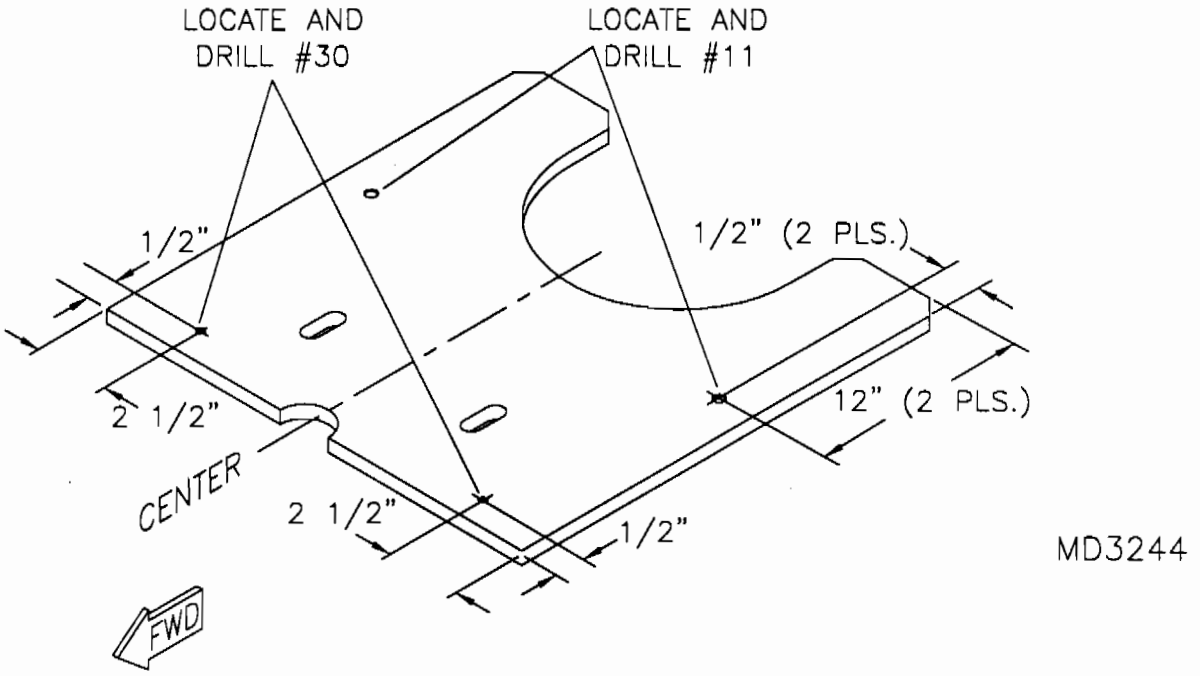
NOTE FOR TRIKES (S-5): Each S-5 rudder pedal has a steering control arm that extends through a slot in floorboard. It may be necessary to file this slot in order to gain clearance for the control arm.

FIGURE 06-03



4. Locate and drill two #30 holes in the forward end of the floorboard as shown in **FIGURE 06-04**. Locate and drill the #11 holes in each side of the floorboard as shown in **FIGURE 06-04**.

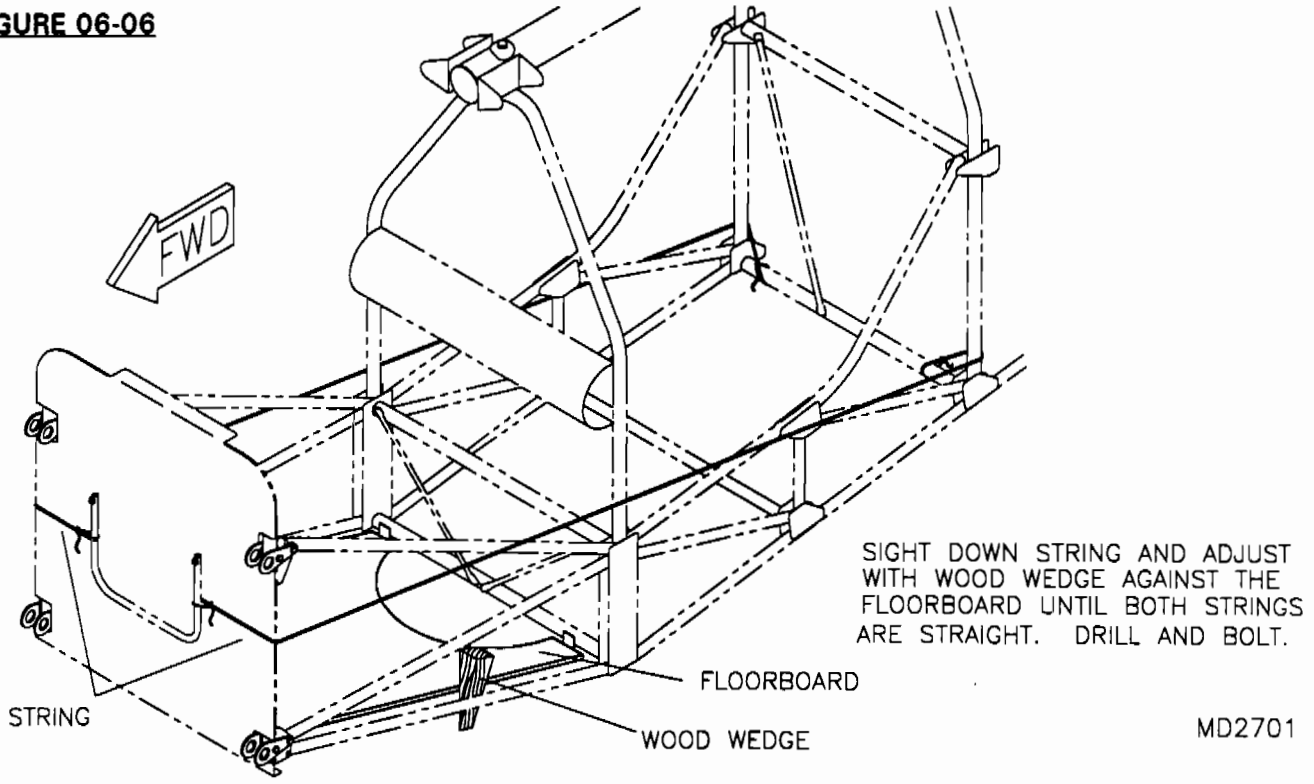
FIGURE 06-04



5. Place the floorboard in the fuselage so that it rests on top of the two attach angles bolted to the station two bottom cross tube and on the firewall's bottom flange. Center the floorboard on the aft attach angles. Using a #11 bit, transfer drill through the attach angles and through the floorboard. Use a scrap wood block placed on top of the floorboard over the holes to prevent splitting on the top side of the floorboard. Bolt the floorboard to the aft attach angles. Note that the bolts are installed from the bottom side up. Refer to the parts drawing.

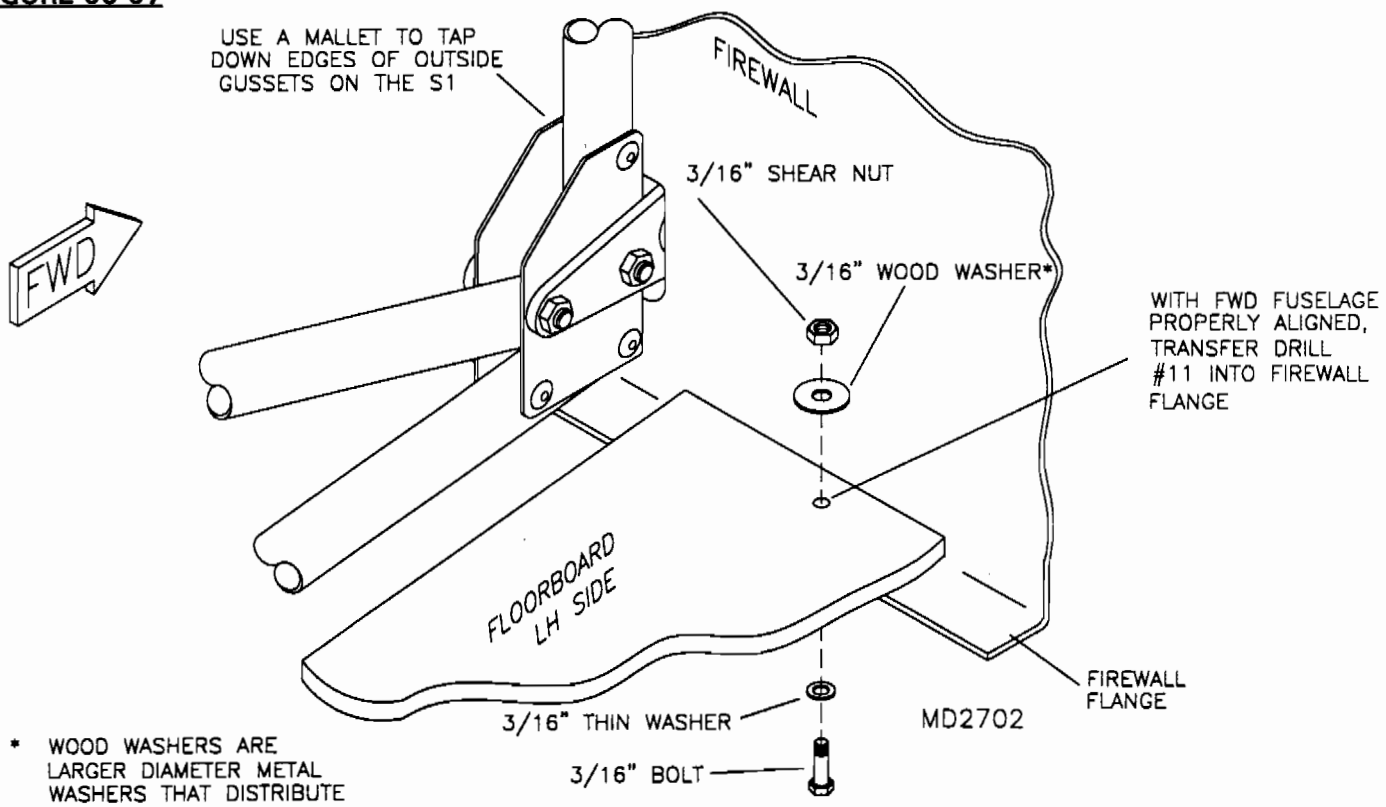
6. Prior to locating the front floorboard holes in the firewall flange, the forward fuselage must be checked for alignment from station one to station two. Do so by tying a string to each side of the station three bottom crossing tube and routing around the aft side of the station three side tube, then straight forward to the firewall lace-up tube. Position the strings in the same location on each side. See **FIGURE 06-06**. Use a wood wedge between the floorboard and bottom longeron to move the S-1 into centerline alignment. Both strings should be sight straight with equal distance between the string and the corresponding fuselage members.

FIGURE 06-06



7. With the forward fuselage properly aligned, transfer drill through the pre-drilled #30 holes in the forward end of the floorboard through the firewall flange. Note that aluminum is harder then wood, watch for hole elongation in the floorboard. To prevent any chance of hole elongation, mark the hole locations onto the firewall flange, remove the floorboard and drill the flange. Install the floorboard, check fuselage alignment and transfer drill from the bottom through the #30 holes in the floorboard. Bolt the floorboard to the firewall flange. Refer to **FIGURE 06-07** and the parts drawing. Bolt from the bottom up.

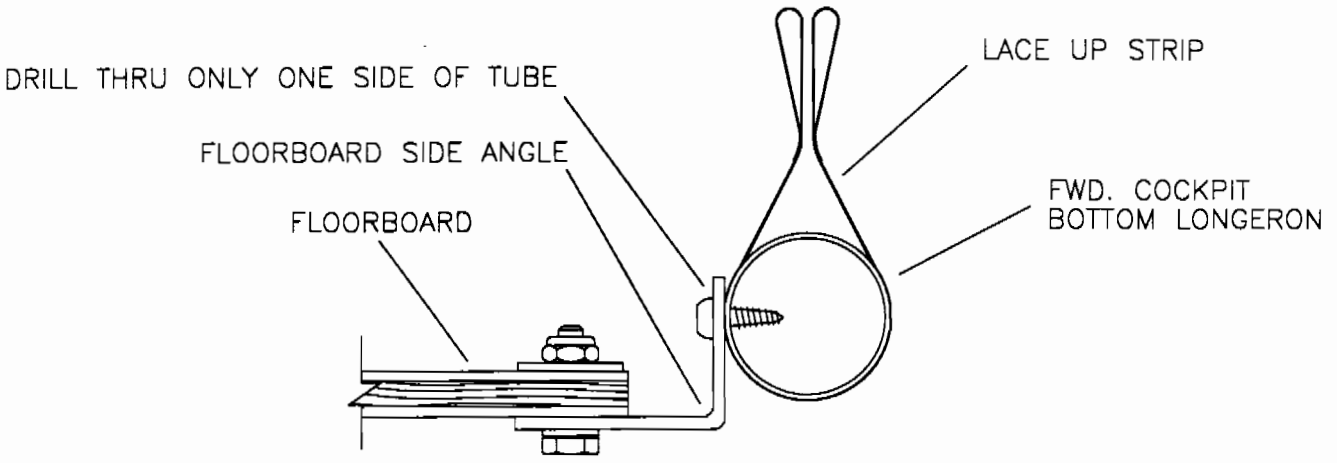
FIGURE 06-07



8. Locate and mark the center of the long leg of the floorboard side angles. Position the floorboard side angles against the bottom of the floorboard with the center line mark visible through the pre-drilled #11 holes. Slide the angles against the inboard radius of the forward cockpit bottom longerons. Position so that the pre-drilled #30 holes in the angles are on centerline of the longerons and clamp in position. Using a #30 bit, transfer drill through the angles into the longerons and cleco. **CAUTION:** Only drill through one wall of the longerons. Refer to **FIGURE 06-08**. Mark the #11 hole location onto the angles. Unclamp and remove the angles. Drill the #11 hole in the angles.

Refer to the covering section and prepare the forward cockpit lace up strips. Wrap the lace up strips around the longerons. Center the lace up strips on the bottom longerons and position so that both edges of the lace up strips are even and straight up. Melt through the lace up strips at the angle mount hole locations. Apply loctite to the screws and attach the side angles to the longerons. Bolt the floorboard to the side angles. Refer to the parts drawing.

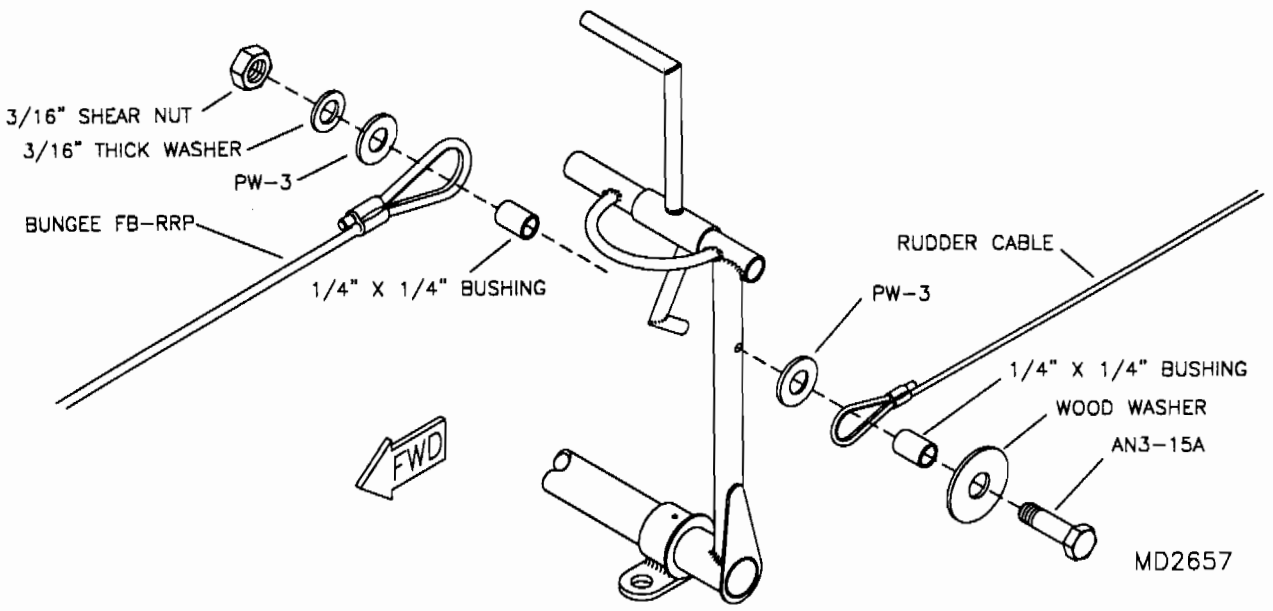
FIGURE 06-08



9. Apply loctite to the bolts and bolt the rudder pedals to the floorboard as per the parts drawing.

10. Fabricate the aluminum bushings and Install the rudder cables and bungee returns to the rudder pedals as per the parts drawing and **FIGURE 06-010**. During final assembly melt through the soundproofing on the firewall and stretch the bungee returns straight fwd, through the pre-drilled holes in the firewall. Slide the wood washers over the bungees. Pull the bungees tight and tie a knot. **CAUTION:** Do not over tighten the bungees. Full rudder pedal travel must be maintained.

FIGURE 06-010



11. Route the rudder cables through the pulley assemblies at station two and through the cable guides throughout the tailcone. The angle of the pulleys can be tweaked for better alignment with the rudder cables. Extend the cables through the tailcone and tape them to the inside of the bottom longerons at station five. After the fuselage is covered the tape will be removed and the cables fed through the skin.

S-4/5 CONTROL STICK ASSEMBLY

1. Select the parts depicted in the control stick parts drawing.

2. Assemble the S2-SAB's as per the parts drawing. Be sure to use a castle nut on the 1/4" bolt through the S2-SAB's and cotter pin the bolt after assembling. **Do not over tighten and be sure to cotter pin!!** If this nut works loose and comes off the bolt, loss of pitch control will result. To center the tube on the S2-SAB, slide the tube over the head of the bolt and stack 3 washers on each side of the push pull tube. Bolt with the hardware shown. **NOTE**: The S2-SAB's must swivel freely but can not be loose or the elevator will have "play".

3. Install the parts shown in **Figure 07-03.** There must be 2" of the torque tube extending beyond the forward edge of the pillow block not the stop ring. Grease the torque tube **before** sliding the stop ring, pillow block and another stop ring over the torque tube. Position the torque tube with the side tubes down as in **Figure 07-03A.** Rivet the stop rings in place without binding against the pillow block. Insert and rivet the 1" end cap into the torque tube.

FIGURE 07-03

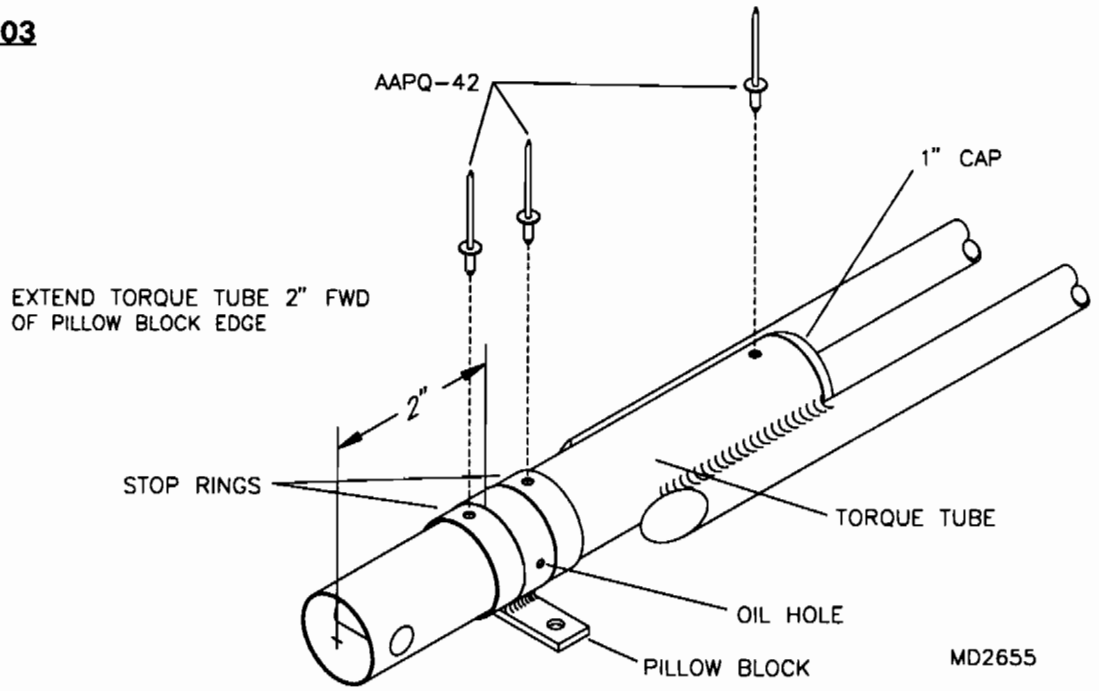
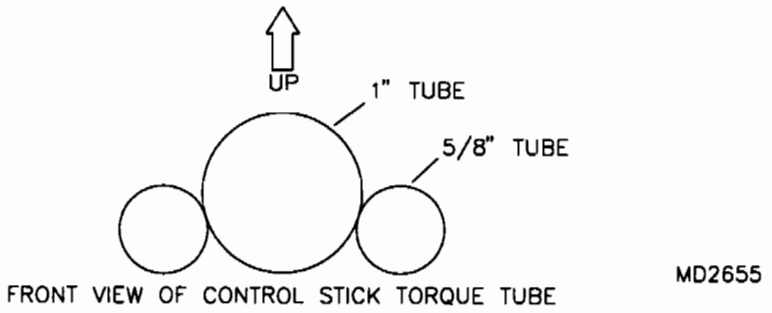


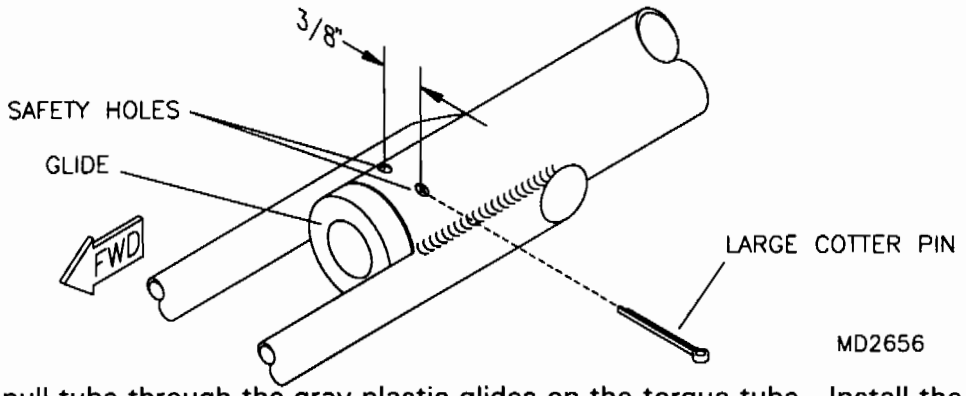
FIGURE 07-03A



FRONT VIEW OF CONTROL STICK TORQUE TUBE

4. Grease the aft end of the torque tube to slip on the pillow block. Insert a gray plastic glide into the ends of the torque tube as per the parts drawing. Once installed, drill a #40 across the safety holes and cotter pin each glide. See **Figure 07-04.** **CAUTION**: When drilling through the glide, be sure not penetrate through the inside diameter. If the cotter pin is exposed to the inside, it will rub against the push pull tube causing it to bind.

FIGURE 07-04



5. Slide the push pull tube through the gray plastic glides on the torque tube. Install the 1/4" eyebolt to the push pull tube as per the parts drawing. The tube should move back and forth freely with little effort. **IMPORTANT**: There should be about 1/32" play between the glide and the push pull tube. If this is not the case, remove the push pull tube and file with a half round file to spec. The glides should **never** be lubricated with any type of oil or grease. This will only allow dirt and grim to collect and possibly stiffen or restrict movement of the system.

6. Using the hardware shown in the parts drawing, install the control connect tube to the torque tube. Drill out the torque tube and control connect tube to 5/16". Coat the bolt and bushing in the torque tube with a grease before installing. Tighten the bolt so there is no play between the parts, but is free to pivot.

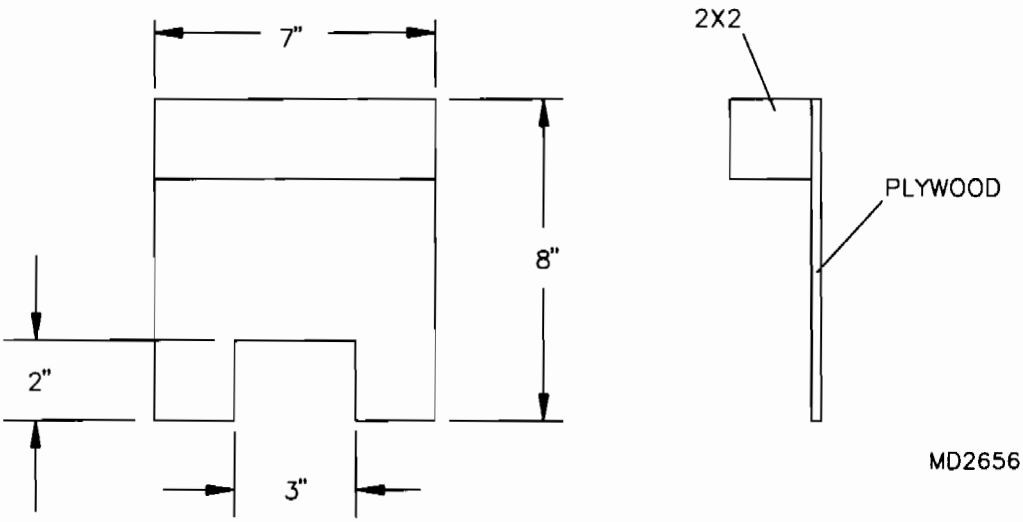
7. Insert the control stick into the control connect tube deep enough to clear the instrument panel. View the stick from overhead and line up parallel to the aircraft's centerline. Drill and bolt with the proper eyebolt as in the parts drawing. Slip on the grip and end cap on the control stick. **HINT**: Apply soapy water on the inside of the grip to ease in installation.

8. Attach the linkage tube to the eye bolts on the control stick and push pull tube with the hardware shown in the parts drawing.

9. Install the control stick assembly to the fuselage using the pillow blocks and the hardware shown in the parts drawing. Bolt up through the S-2 and S-3 bottom crossing tubes and check for freedom of movement. **NOTE**: Over tightening may cause binding of the pillow blocks. The control stick assembly needs to be installed prior to covering.

10. Refer back to the S-3 section for the parts to install the dual teleflex retainer. To assist in getting the correct distance between the S-3 and teleflex retainer a plywood jig needs to be made. Follow the dimensions in **Figure 07-10** to make the jig. Place the jig on the S-3 bottom cross tube with the 2x2 facing fwd. Place the dual teleflex retainer on top of the jig. Bolt as per the S-3 parts drawing.

FIGURE 07-10



S-4 MAIN LANDING GEAR ASSEMBLY & INSTALLATION

NOTE: The complete landing gear assembly will have to be removed in order to skin the fuselage. However, it is recommended to completely fit and install all parts in the landing gear assembly prior to covering. During final assembly after skinning locate all holes and melt through the fabric with a hot knife.

1. Chase drill the pre-drilled 3/16" hole in the top of the gear attach channel to 1/4". Remove the bolt retaining the outer support angle to the forward end of the aft cockpit bottom longeron. Bolt the gear attach channel to the underside of the longeron with the channel extending inboard. Refer to **FIGURE 08-01.** Remove the nut from the bolt retaining the floorboard attach angle to the station 2 bottom cross tube and install the inner support angle onto the aft side of the cross tube. Discard the washer, it is not used in this installation. The inboard edge of the support angle may need to be lightly filed to clear the 1" saddles. Refer to **FIGURE 08-01A.** Perform this step for both right and left hand sides.

Place a straight edge across the sides of the two attach channels to bring them into alignment with each other. With the channels aligned and using a #11 bit, transfer drill through the pre-drilled hole in the inner support angle into the gear attach channel. Bolt the gear attach channel to the inner support angle. Refer to the parts drawing.

FIGURE 08-01

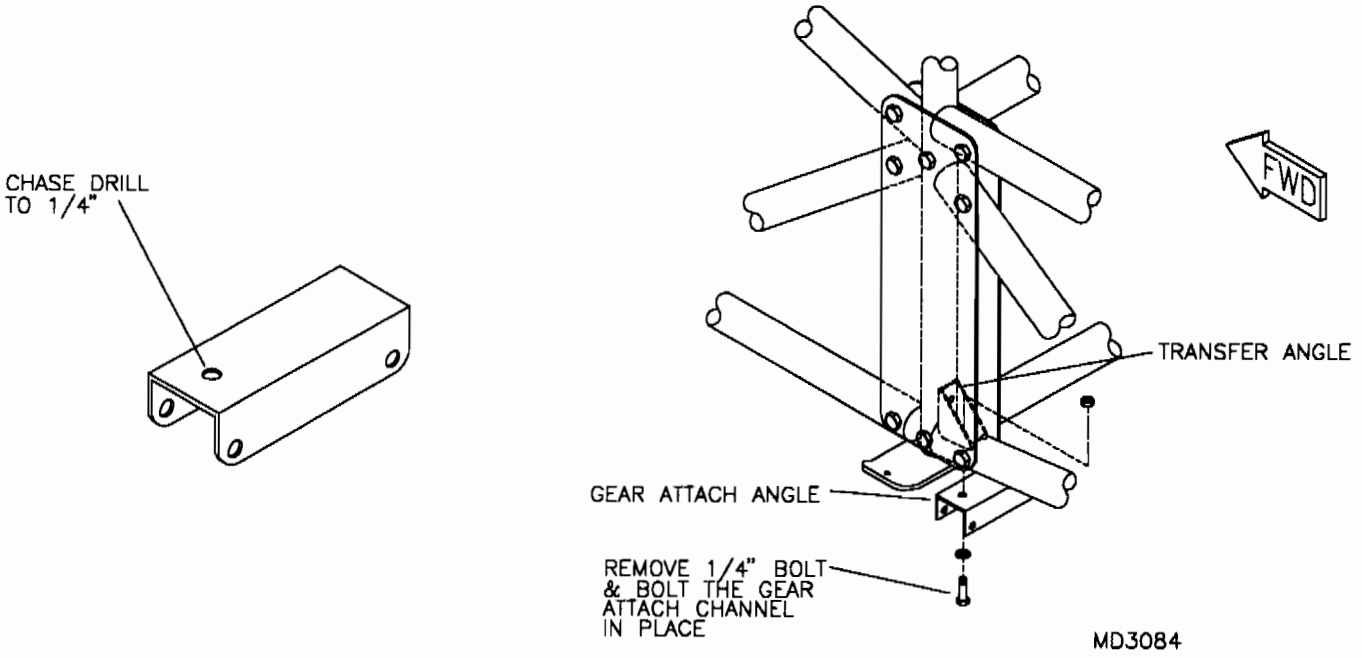
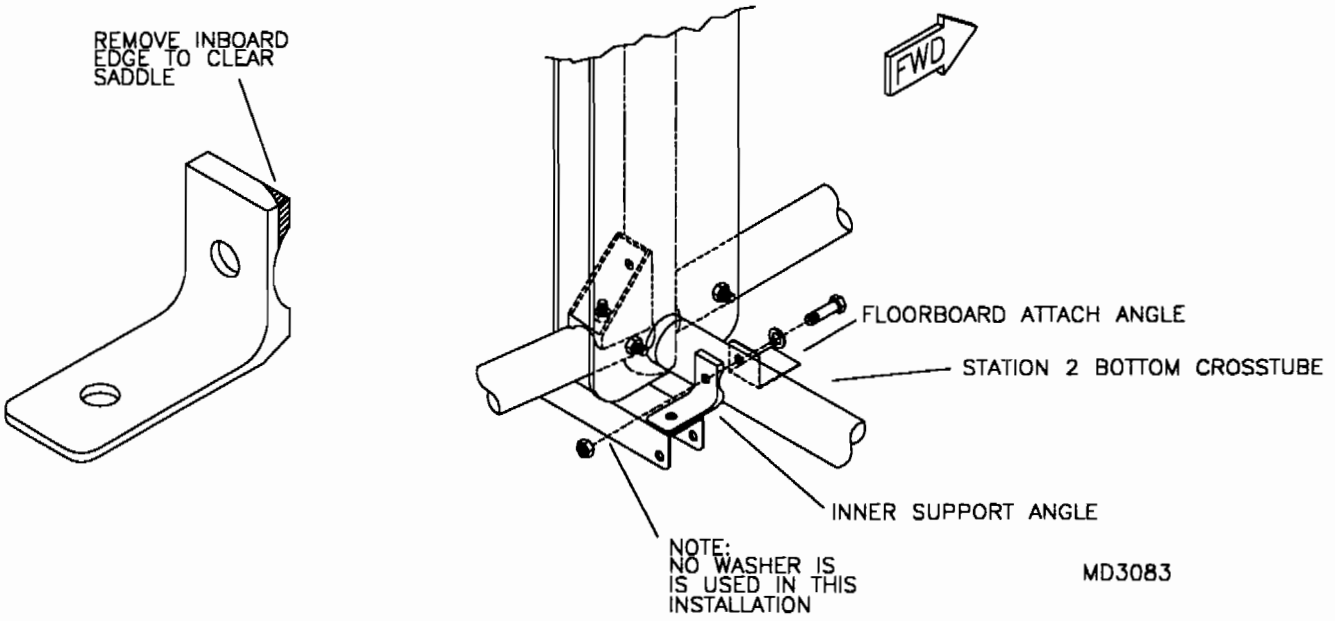
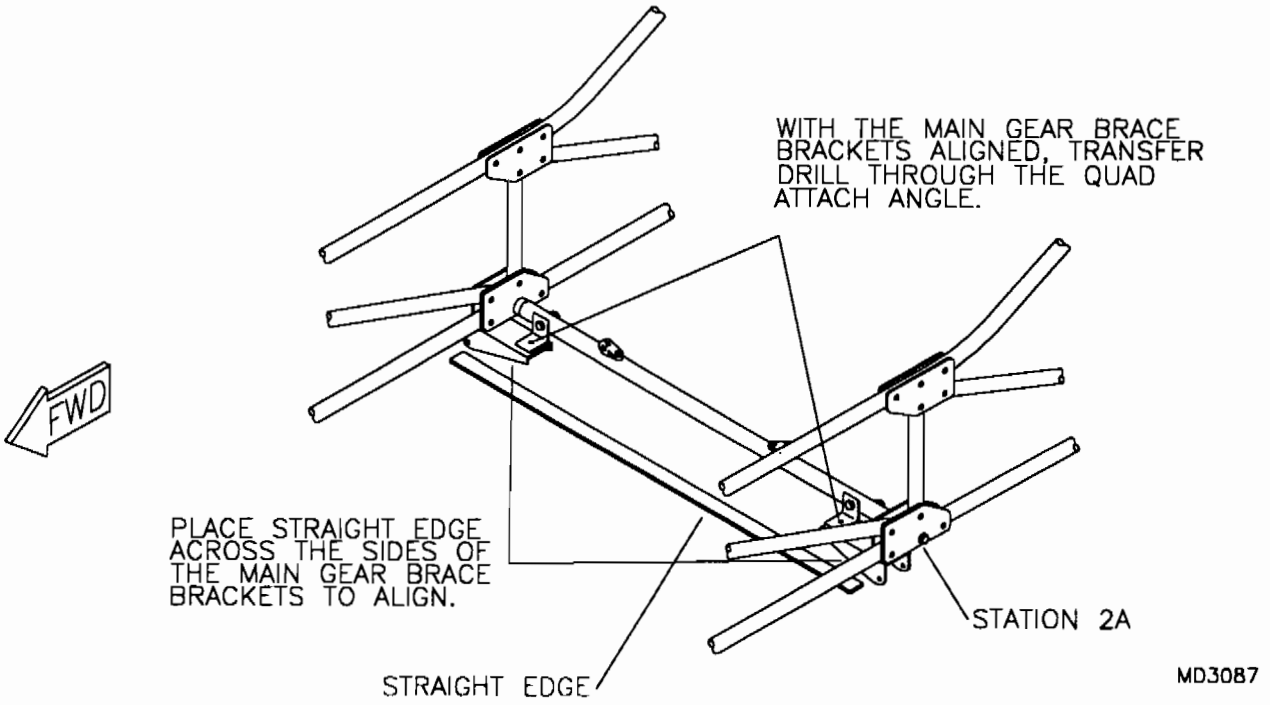


FIGURE 08-01A



2. Chase drill the 3/16" pre-drilled hole in the top of the main gear brace bracket to 1/4". Bolt the main gear brace bracket to the bottom of the aft cockpit longeron just forward of the station 2A bottom cross tube. Place a straight edge on the sides of the brackets to align them with each other. With the brackets aligned and using a #11 bit transfer drill through the pre-drilled hole in the quad attach angle into the main gear brace bracket. Bolt the bracket to the angle. See **FIGURE 08-02.**

FIGURE 08-02



3. Bolt the "V" Brace to the inboard hole in each attach channel. Note the use of spacer washers to center the "V" Brace within the channel. Refer to the parts drawing. Due to welding draw and spring back, some persuasion may be needed to obtain hole alignment with the "V" Brace. A small drift punch works well to help align the holes.

Slip the bungee covers over the top of the gear legs and position over the bungee on the gear legs. The covers will fit loosely over the bungee and are retained by the elastic on each end. Bolt the gear legs to the "V" Brace near its center point. Refer to the parts drawing.

Bolt the landing gear compression tubes into the gear attach channels. Bolt the lower end of the compression tubes into the two tabs extending up from the axle sockets on the lower end of the gear legs. Install the S2-SABs on the aft side of the tabs using the same bolt that retains the compression tubes. Refer to the parts drawing.

Bolt the upper end of the aft brace into the main gear brace bracket. Note that there is a left and right hand aft brace. Be sure to install them accordingly. The angle cut on the top end of the aft brace should be to the outside. Bolt the lower end of the aft brace into the S2-SAB on the lower aft side of the gear leg.

This completes the assembly and installation of the main landing gear. Continue with the brake systems assembly. Refer to that section.

S-4 & S-5 BRAKE SYSTEM ASSEMBLY

The toe brake system is cable operated. The cable housings and cables enter the brake pedals from the **BOTTOM**. The brakes are actuated by pushing against the brake pedal which in turn pushes against the cable housing. This is opposite of normal operation, however, the function is just the same. If the cable housing was retained in a stationary stop it would still push against the housing to operate. That is simply how cable brakes work, regardless of how they are hooked up.

1. Radius the edges of the cam bolt as shown in **FIGURE 08A-01**. Lightly lubricate the shank of the cam bolt and slide it into the bushing in the assembly plate. Refer to the parts drawing. Note the orientation of the assembly plate and cam bolt. Install the cam arm, lock washer and brake nut. Note that there is a left and right hand cam arm as well as a left and right assembly plate. Assemble accordingly. Also note that the cam arm can be installed in several different positions on the cam bolt. Orientate the cam arm on the cam bolt exactly as shown in the parts drawing. Tighten the nut and check for freedom of movement of the cam arm and bolt. If the arm and bolt do not rotate freely, verify that the cam arm has been tightened against the shoulder of the cam bolt and not against the bushing in the assembly plate. If the arm tightens against the bushing, remove the arm and bolt and lightly file the length of the bushing. With the cam bolt fully inserted into the bushing, a small edge of the shank should be seen extending out of the bushing. Refer to **FIGURE 08A-01A. CAUTION:** Removing to much of the bushings length, will result in excessive play.

FIGURE 08A-1

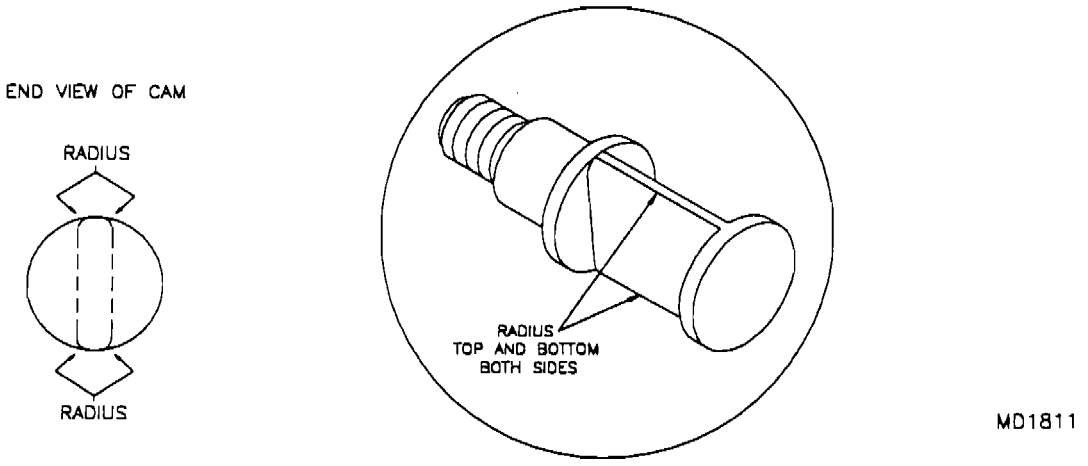
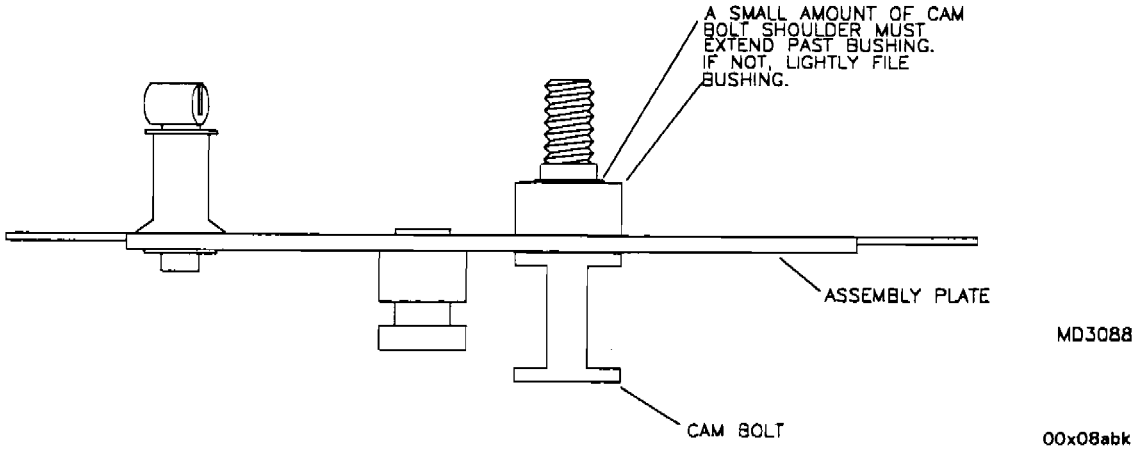


FIGURE 08A-01A



2. Install the brake pads onto the assembly plate as shown in the parts drawing. The lower end of the pad mount flange will set against the flat surface of the cam. Install the springs into the holes between the brake pads as shown. Refer to the parts drawing. If after assembly a more positive pad return is desired, a second set of holes may be drilled outboard of the existing set for more spring tension.

NOTE: This completes the assembly of the brake pads. Refer to the wheel assembly and installation section before continuing with the following steps. After the wheels and brakes have been installed on the landing gear, refer back to this section and continue with the installation of the brake cable housings and cables.

NOTE: In order to continue with the following steps the floorboard and rudder pedals must be installed. It is recommended to assemble and pre fit all parts on the aircraft prior to covering. The landing gear will have to be removed in order to skin the fuselage. Keep this in mind when cutting the brake cable to length. Be sure to leave plenty of cable length.

If you find a need to lubricate the cables, do not use a petroleum based lubricant, as this will only attract dirt into the housing and worsen the problem. Dry graphite powder works well for a cable lubricant.

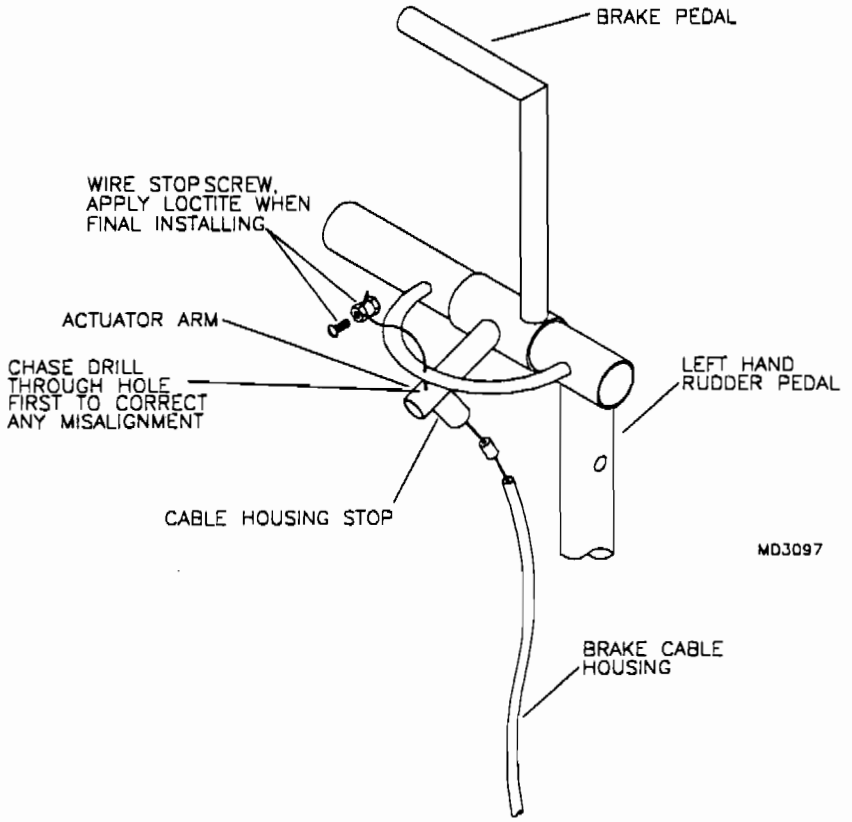
Braided cable has a tendency to fray when cut. To prevent this, determine the area to be cut. Using a soldering iron, place a small amount of solder in this area. The solder will wick into the cable and allow the cable to be cut smooth without fraying. This also allows for easier insertion into the cable housing and wire stops.

3. The brake cable housings route from the cable housing stops on the under side of the brake pedal actuator arms to the swivel stops on the upper aft portion of the assembly plates. The exact routing of the brake cable housings is left to the builders discretion and preference. In planing the routing of the housings avoid any sharp turns or bends. Determine the length of housing needed and cut each side to length. A good side cutters can be used to cut the cable and cable housing. The cut should be clean without any burrs that may cause wear and eventual failure of the cable. Grind or file smooth the end of any poorly cut housing.

4. With the housings cut to length, determine the length of brake cable needed on each side and cut. Make sure the cut is clean with no burrs. With a friend holding one end of the housing, pull the cable housing straight and feed the cable through. Allow equal amounts of cable to extend from each end of the housing. Install a ferrule end cap on one end of the housing and cable. Insert this end of the cable through the bottom of the cable housing stop on the actuator arm of the brake pedal and up through the small hole in the stop. To correct any hole misalignment in the actuator arm and prevent cable chaffing, chase drill through with a #40 bit prior to installing the cable. Refer to **FIGURE 08A-04.** Install the wire stop on the cable and finger tighten the screw.

Route the cable and housing to the wheel/brake assembly. Install an end cap ferrule on the housing and insert into the swivel housing stop. Install the wire swivel stop in the cam arm. Extend the cable through the wire swivel stop and finger tighten the screw. Complete this procedure for both sides of the aircraft.

FIGURE 08A-04



NOTE: It is not necessary to set or adjust the brakes until final assembly after the fuselage has been skinned. Be sure to apply loctite to the wire stop screws before tightening

5. Make sure that there is a sufficient amount of cable extending beyond the wire swivel stop in the cam arm. Apply loctite to the screw and tighten the wire stop on the brake cable at the brake pedal. Pull the cam arm up just slightly to the point that it just starts to spread the brake pads. Gently pull any slack out of the cable at the cam arm and apply loctite and tighten the wire swivel stop screw. Perform this procedure for both sides. At this setting the brake pedals should feel even without excessive travel before actuation. When you are satisfied with the brake setting cut the bulk of the brake cable tail. **CAUTION:** Keep in mind that mechanical brakes require periodic adjustment, especially after the first couple of high speed taxis and the pads start to seat in to the drum. As a result be sure to leave enough cable length to make necessary adjustments.

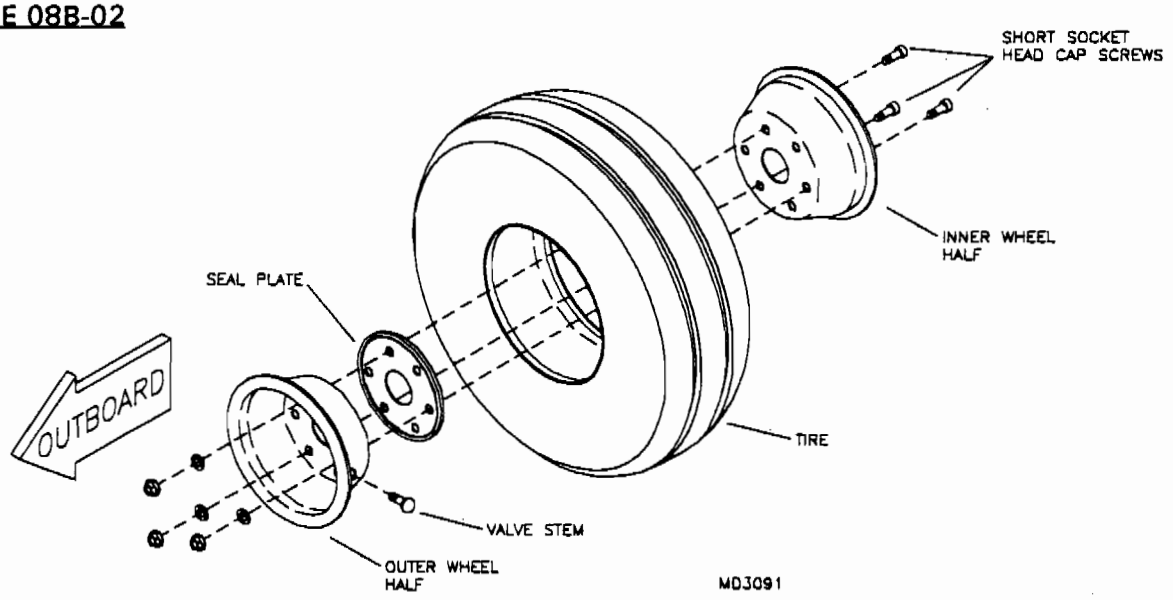
S-4 & S-5 WHEEL ASSEMBLY AND INSTALLATION (MAINS)

NOTE: The following instructions are for mounting a tubeless tire. If you prefer to install tubes, contact our parts department. In this case, the valve stem should not be installed in the outer wheel half.

1. If not already done so, install the rubber "O" rings into the machined grooves on each side of the seal plate. Do not use silicone on the "O" rings to form a seal! Insert the valve stem into the outer rim. In lieu of a valve stem puller a 1/4" allen wrench works well to push the valve stem through. Since the valve stem is permanent, a small amount of silicone sealer can be used around the sealing neck to insure against leakage.

2. Place the tire over the inner rim. Insert three of the shorter socket head cap screws into every other hole in the rim. Slide the seal plate over the bolts. Slide the outer wheel over the bolts. Install the washers and nuts and tighten the wheel halves against the seal plate. Refer to **FIGURE 08B-02**. Note the direction of the bolts.

FIGURE 08B-02



NOTE: If you are installing wheel pants or a 5" wheel, spacer bushings are required between the brake drum and the hub. Turn to those sections of the manual now for the spacer bushings. When proceeding with the following step, be sure to install the spacer bushings.

3. Using the longer socket head cap screws, bolt the brake drum to the main hub using the three threaded holes in the hub. Note the orientation of the hub. The brake drum mounts to the side of the hub that has the longer, tapered bearing housing. See **FIGURE 08B-03**. Install the hub/brake drum assembly into the inner wheel well. The heads of the shorter socket head cap screws will recess into the holes drilled into the hub. Install the washers and nuts on the longer cap screws and tighten the hub/brake drum assembly to the wheel assembly. Refer to **FIGURE 08B-03A**. Inflate the tires by standing the tire up and pressing downward so as to spread the bead and create an air lock. Inflate to the recommended pressure of 25PSI. **CAUTION**: Make sure all bolts are tight before inflating the tires.

FIGURE 08B-03

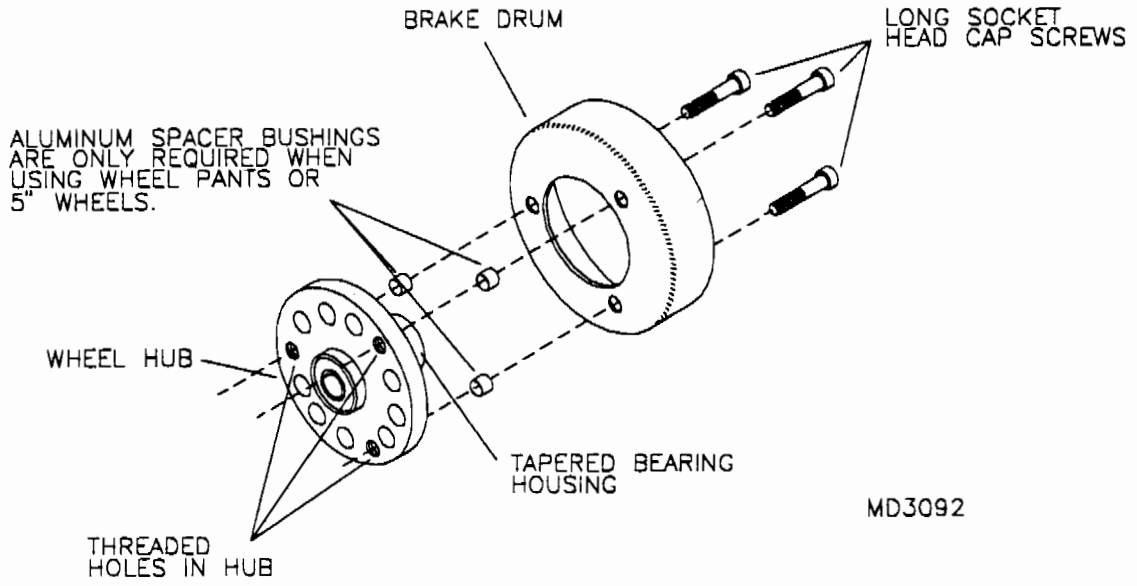
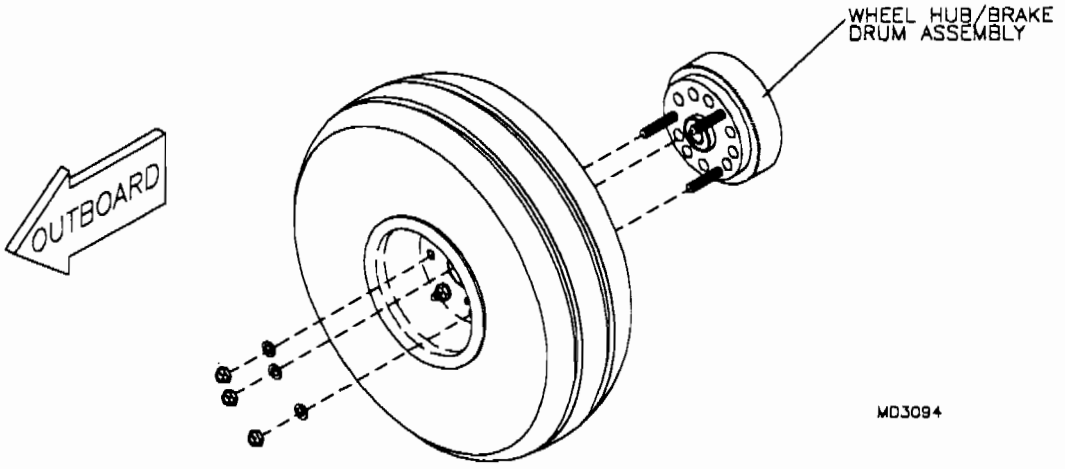


FIGURE 08B-03A



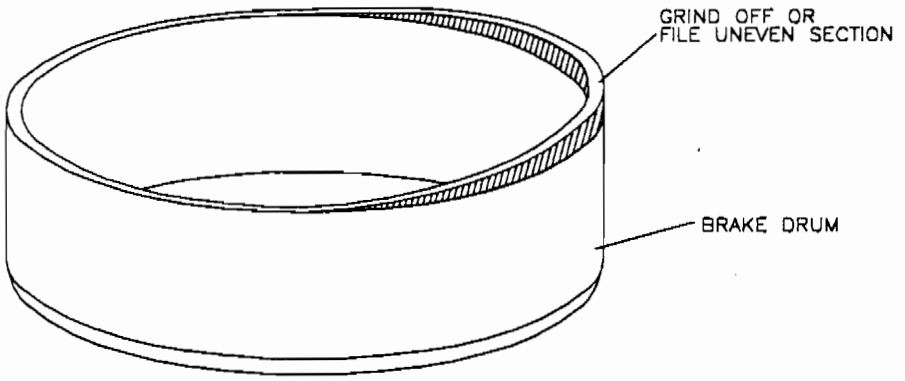
NOTE: A different axle is required if you are installing the optional wheel pants. Refer to that section now for the axle. In this case the 5/8" nut and shims are not used.

4. Slide the axle through the bearings in the wheel assembly. Install the nut and the shim on the threaded end of the axle until approximately 3 threads are left prior to bottoming. Slide two shims over the axle extending through the wheel. Slide the brake assembly over the axle so that the brake pads extend into the drum. Insert the axle and wheel/brake assembly into the axle socket on the lower end of the gear leg. Note that there is a left and right hand assembly. Install accordingly.

Rotate and position the brake assembly so that the cam arm is pointing aft and is parallel to the ground. Temporarily hold the assembly plate tight against the two tabs on the gear leg socket and bottom the wheel assembly against the shims and axle socket. In this position the brake pads should be flush with or have no more than 1/16" extending beyond the drum edge. Add or delete shims accordingly until this is achieved. It is not unusual for the drum to not be perfectly true. It may be that with one section of the drum flush with the brake pad, another section of the drum may extend past the pad. If this is the case, determine the widest section and grind or file until the drum is true. Refer to **FIGURE 08B-04**.

Pull the cam arm up until the brake pads are spread tight against the inside of the drum. Using a piece of safety wire or similar material tie the cam arm to the cable stop to hold the brake pads firm inside the drum. Using a #11 drill bit, transfer drill through the pre-drilled hole in each tab on the axle socket into the assembly plate. Remove the safety wire to release the pads. Remove the wheel and tire assembly and bolt the assembly plate to the axle socket. Refer to the parts drawing. Install the wheel and tire assembly and check for pad/drum placement as previously explained. Add or delete shims accordingly. If more than three shims are needed, it is acceptable to fabricate a spacer bushing to the correct length. Use 3/4" x .058" aluminum raw stock to fabricate these bushings. The wheel/brake drum assembly should spin freely around the brake pads.

FIGURE 08B-04



5. With the wheel and brake assembly properly set and with the axle fully inserted into the axle socket, the inboard end of the axle should be flush with the inboard end of the axle socket. If not, make adjustments by tightening or loosening the nut on the outboard end of the axle.

With the inboard ends flush, scribe the hole location of the axle socket onto the axle. Remove the axle and center punch the center of each hole scribed on each side of the axle. Using a #40 drill bit, drill half way through the axle from one side. Rotate the axle and drill through from the other side until meeting the first hole. Using a #30 drill bit, chase drill from both sides following the same procedure. Install the axle and wheel assembly in the axle socket. Using a #11 drill bit, chase drill through the axle socket and axle from both sides. Tight hole tolerances must be maintained. Any hole elongation will be enhanced in a short period of time. Do not use the axle socket as an initial drill guide. Hole elongation in the socket can occur.

Bolt the axle in the socket. Refer to the parts drawing. Take out any end play in the wheel assembly by tightening the nut on the outboard end of the axle. **CAUTION:** Tighten the axle nut just enough to remove any end play in the wheel assembly. Over tightening this nut may cause bearing failure.

6. Refer to the brake systems assembly section for the installation of the brake cables and cable housings.

TAILWHEEL ASSEMBLY

16. Slip the longer of the two wheel spacers (short segments of 3/4" aluminum tubing) over the fork axle. Slip on the tailwheel and then the short spacer. Position the spacer to eliminate side play and center the wheel. Take note of how far in to drill the cotter pin hole. Remove the wheel and drill a #40 hole through the axle and spacer. Debur, re-assemble and cotter pin.

17. Bolt the swivel block to the tail spring with the hardware shown. **NOTE**: It may be required to grind down the tail spring to allow insertion into the swivel stub. Please re-paint if this is done.

18. Prop up the plane's tail and bolt the tail spring to the fuselage with the hardware shown. **NOTE**: This is to be done after the fuselage is covered and the holes for the tail spring are melted through the fabric. **NOTE**: If the tail spring is mismatched or crooked to the aircraft's center line, it is acceptable to slot the tail spring hole with a small round file.

19. Loctite the grease fitting and screw it into the swivel block. Grease the shaft of the fork and insert the fork/wheel assembly into the swivel block.

20. Slip the steer horn over the fork stub protruding out of the swivel block. Line up the horn 90 degrees to the wheel and drill through #11 from each side for the retainer bolt. Bolt on the horn with the bolt head facing forward. Bend up the two tabs across from each other on the cover cap (to miss the retainer bolt) and snap the cap in place.

21. Slip the "S" hooks in the holes on the end of the steer horn on both the rudder and tailwheel. Attach the steer springs to the "S" hooks. To help in putting on the second spring, turn the rudder into the tailwheel steer horn. Close the "S" hooks once the springs are hooked up.

22. Check for proper tailwheel function by moving the rudder side to side. The tail should move easily and freely with the movement of the rudder. Too much slack in the system will result in directional control problems. Tighten the springs by reducing the chain length.

S-4/5 SEAT ASSEMBLY

1. Select the parts depicted in the parts drawing for the seat.

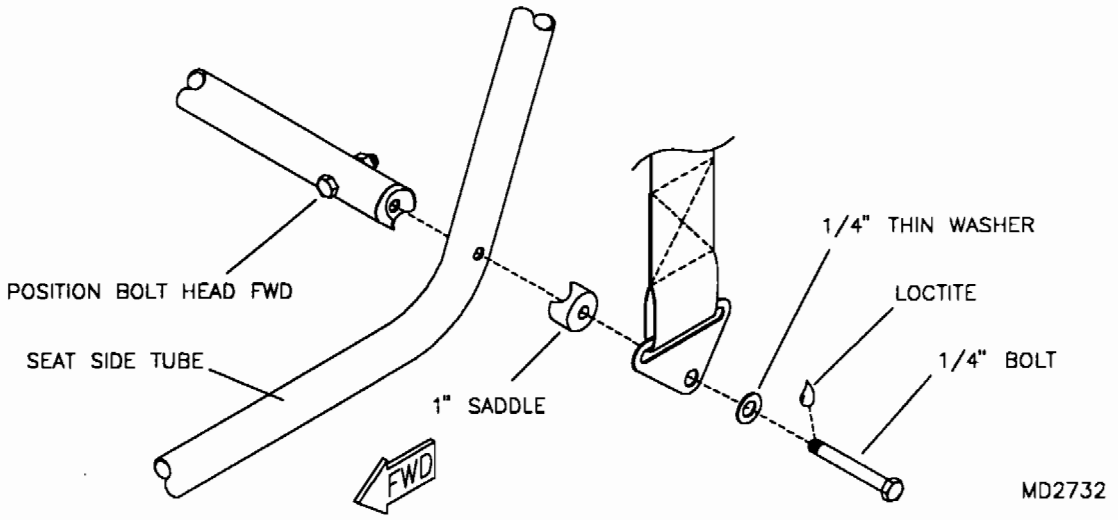
2. Install the "I" Nuts and 1" compression tube fittings into the spreader tubes with the correct hardware. Refer to the parts drawing.

3. Insert the seat top into the side tubes. Note that there is a left and right as well as a back and bottom to the side tubes. The left side frame has two vertical holes in the bottom forward end. The bottom leg of the side tubes is the longer of the two and has three holes drilled through the tube at the forward end. Orientate correctly. The seat sling will retain the seat top.

4. Apply loctite to the 1/4" bolts and install one of the spreader tubes between the side tubes at the forward location, approximately 8" aft of the forward end of the side tubes. Orientate the spreader tube so that the bolt heads retaining the "I" nuts are pointing forward. Refer to the parts drawing and **FIGURE 09-05**.

5. Apply loctite and install the second spreader tube into the aft location. Note that the bolt that retains the aft spreader tube also secures the 1" saddle, hang strap and thin washer. Install them to the outboard side of the side tubes. See **FIGURE 09-05**.

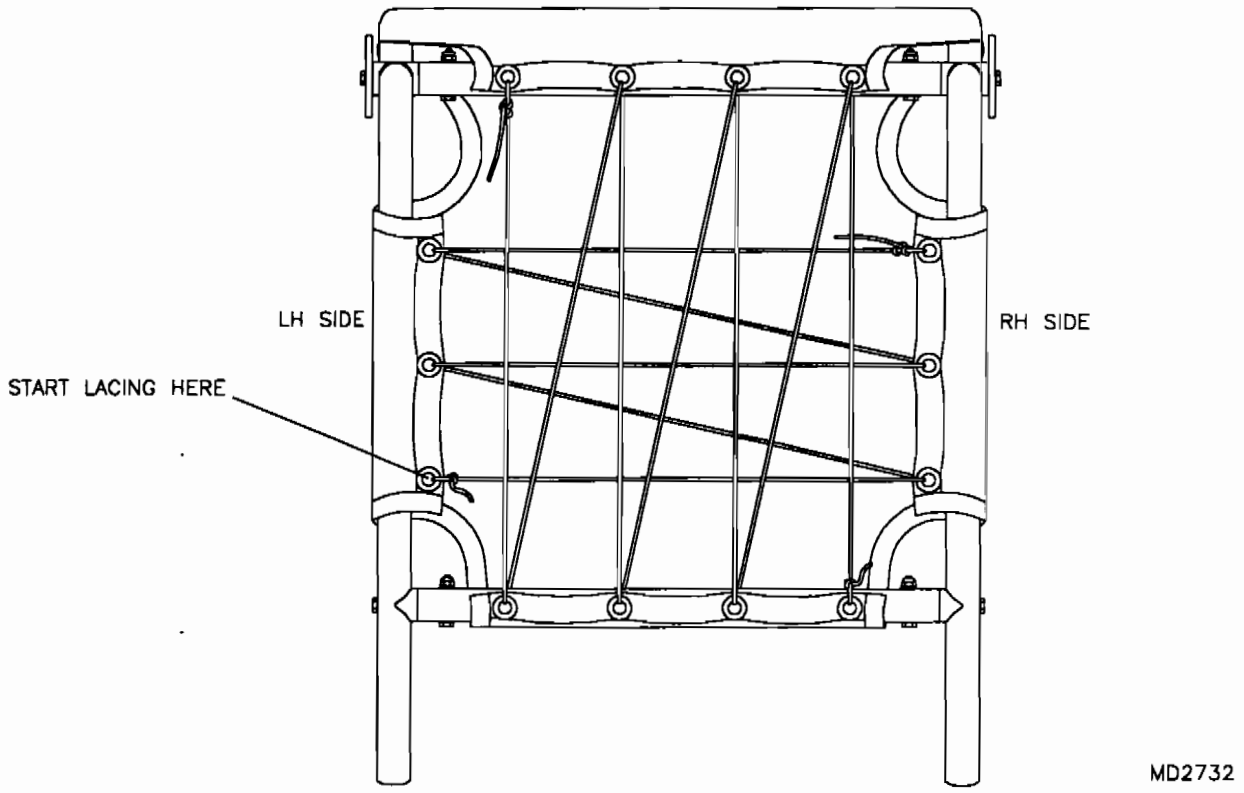
FIGURE 09-05



NOTE: If you have purchased the Deluxe fabric options or the headrest option, refer to the options section of the manual for the installation of the headrest before continuing.

6. Remove the headrest (if purchased). Slip the seat sling over the top of the seat frame. Work it down the frame until bottomed. The bottom of the seat will be laced with two equal lengths of lacing cord. Determine the length of cord needed and cut. Use a hot knife or soldering iron to melt the ends of the cord to prevent fraying. lace the sides of the seat bottom first, then for. and aft. Follow the lacing pattern shown in **FIGURE 09-06**. The lacing should be fairly tight but be careful not to over tighten for it may cause the seat to gap. After lacing the sides, re-positioning of the sling may be needed. Do so before going further. Inspect your work....the seat sling should be drum tight across the bottom and set evenly on the frame. Re-tightening may be required after 5 to 10 hours of flying (depending on your landings). When satisfied with the fit and tension of the seat sling, melt through the fabric at the riv-nuts and install the headrest (if purchased).

FIGURE 09-06



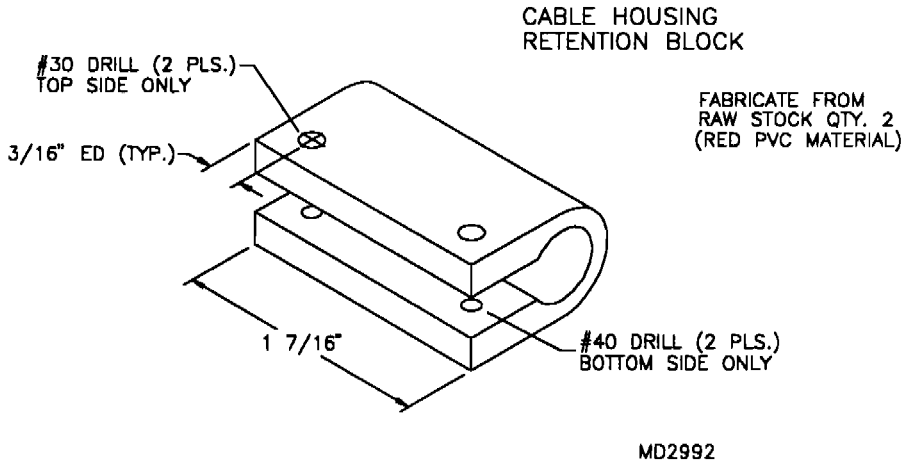
7. Using the two pre-drilled vertical holes, bolt the Quad attach angles to the top side of the forward end of the left hand seat side tube bottom. Refer to the parts drawing. Note the orientation of the angles.

S-4/5 THROTTLE QUAD ASSEMBLY & INSTALLATION

1. Select the parts depicted in the parts drawing.

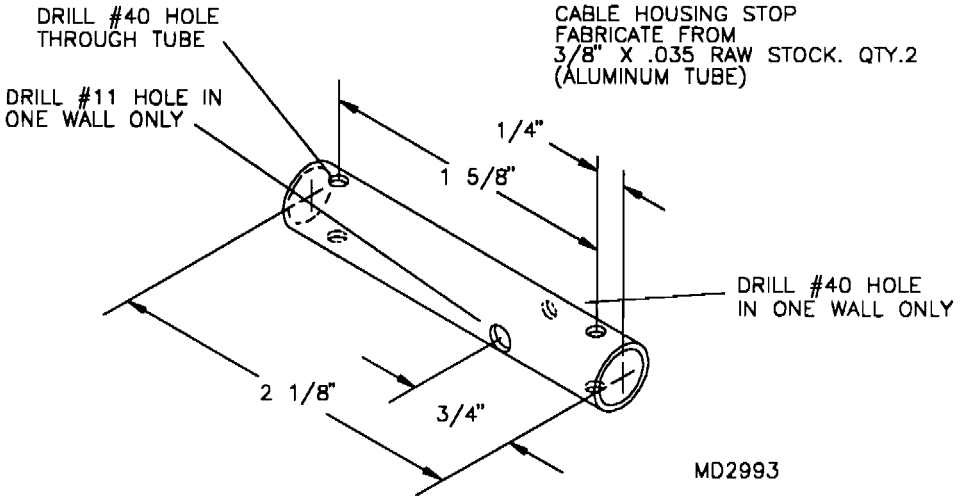
2. Using the raw stock provided fabricate two cable housing retention blocks as shown in **FIGURE 09-02**. Install the machine screws into the blocks. The screws will self tap into the bottom #40 hole. Do not tighten the screws at this time. The screws will be tightened when the throttle and trim cable housings have been installed.

FIGURE 09-02



3. Using the raw stock provided fabricate two cable housing stops as shown in **FIGURE 09-03.**

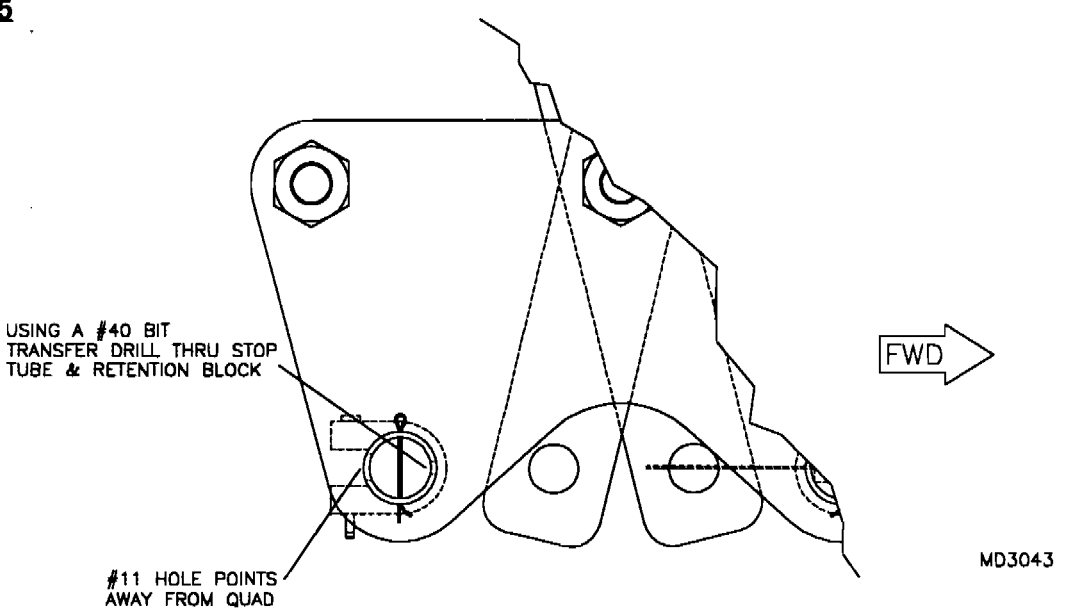
FIGURE 09-03



4. Drill out to 1/4" the pre-drilled hole in the lower end of the throttle and trim levers.

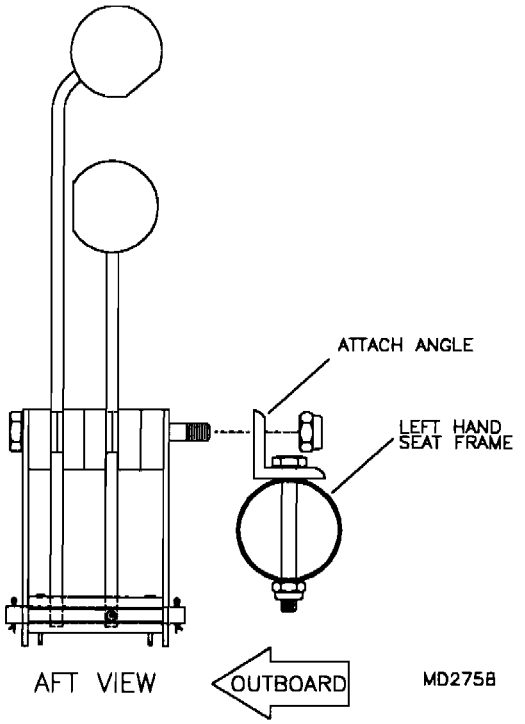
5. Assemble the side plates, spacers and levers as per the parts drawing. Note the orientation and order of assembly. Only finger tighten the nuts on the two outside bolts at this time. These bolts will be used to mount the throttle quad to the seat. The trim and throttle levers should move smoothly with light friction. Lever tension is adjusted by tightening or loosening the center pivot bolt. Install the cable housing retention blocks. Note the orientation of the blocks. Slide the stop tubes through the side plates and through the retention blocks. Note the orientation of the stop tubes. Install the cotter pins to retain the stop tubes. With the retention block positioned correctly, orientate the stop tube so that the #11 hole is pointing away from the throttle quad. With a #40 bit transfer drill through the #40 hole in the stop tube, through the retention block. Refer to **FIGURE 09-05.**

FIGURE 09-05



6. Bolt the throttle quad assembly to the outboard side of the attach angles previously bolted to the left side of the seat frame. Refer to the parts drawing and to **FIGURE 09-06.**

FIGURE 09-06

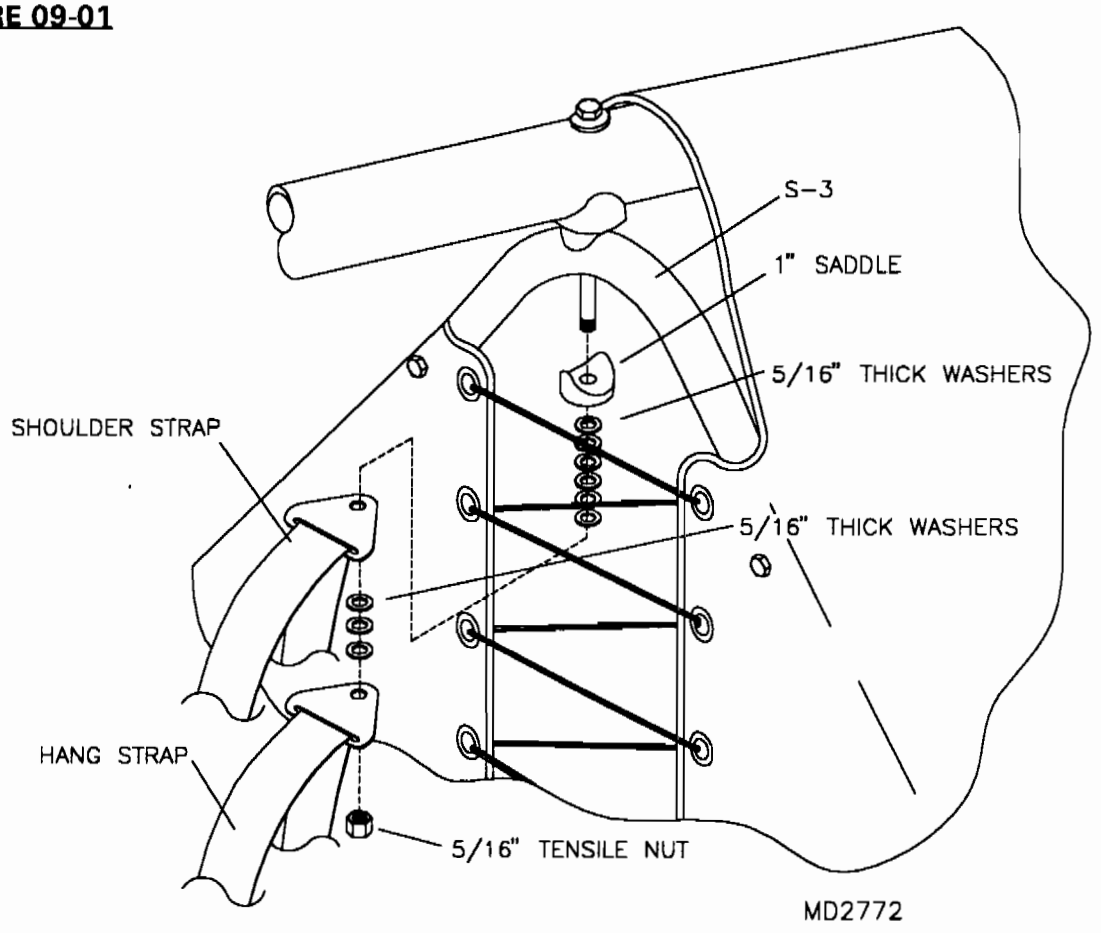


SEAT BELT AND SEAT INSTALLATION

NOTE: This section is to be completed after the fuselage has been covered.

1. Bolt the shoulder strap and seat hang strap plate to the lower end of the station 3 keel bolt as shown in **FIGURE 09-01**. Note the correct usage of spacer washers.

FIGURE 09-01

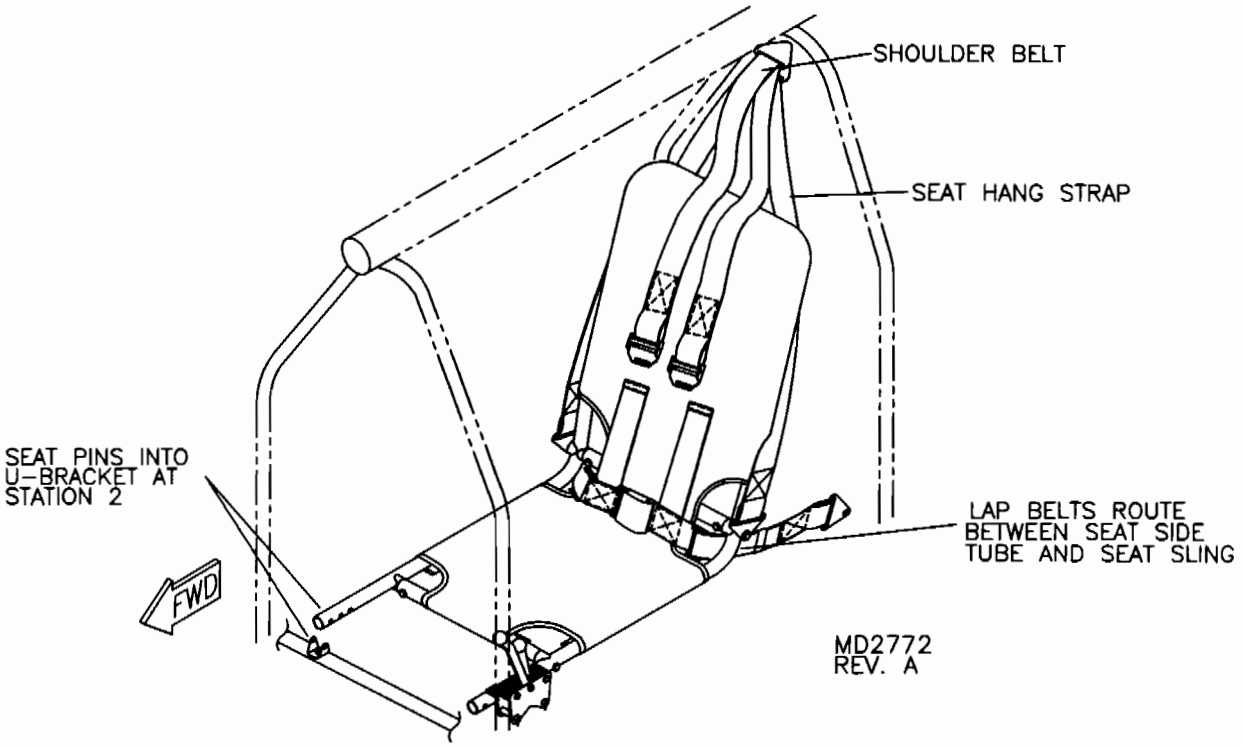


2. Bolt the lap belts to the tangs previously installed on the lower longeron gussets at station 3. Refer to the parts drawing.

3. Install the seat and throttle quad assembly into the fuselage by pinning the forward end of the of the seat bottom into the "U" brackets bolted to the top side of the station 2 top cross tube. The three holes allow for a small Forward and Aft adjustment to suit the pilots comfort.

Route the long left hand hang strap up and through the hang strap plate and down through the right hand hang strap adjustor. Route the lap belts between the seat side tubes and the seat sling just below the aft spreader tube. Refer to **FIGURE 09-03**. Route the shoulder belts to the lap belts as shown in **FIGURE 09-03**.

FIGURE 09-03



4. Refer to the engine section (for single carb.) or the options section (for dual carb) for throttle cable routing and installation. Refer to the tail section for the trim cable routing and installation.

WINDSHIELD ASSEMBLY AND INSTALLATION

It is recommended to fit the windshield **BEFORE** covering.

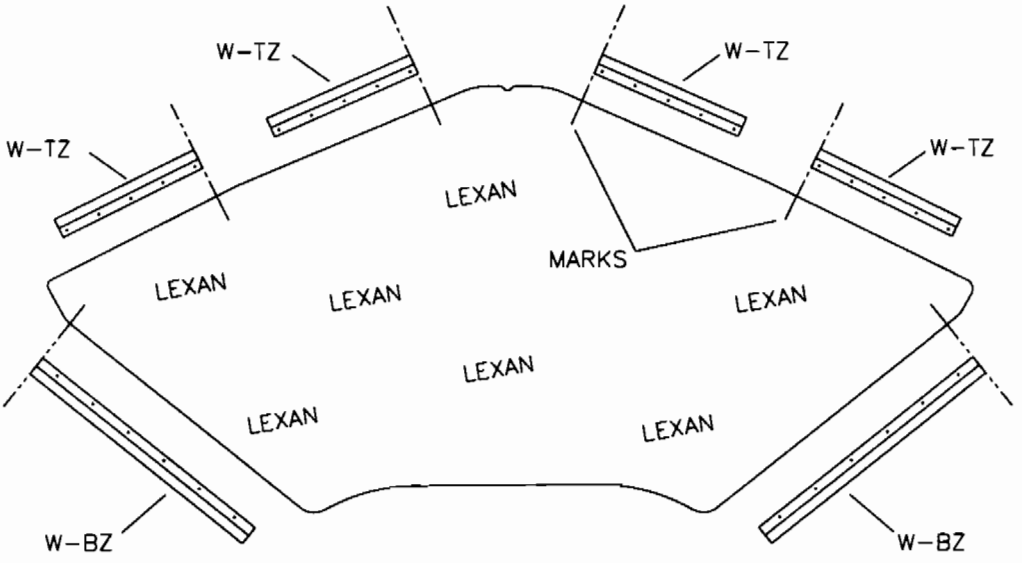
Here are a few pre-cautions about the lexan windshield material:

1. It scratches easily so don't peel off the paper until prior to take-off!
2. Gasoline will craze it...not the first spill but continued exposure will damage it. Acetone, MEK, or loctite will craze it almost before it contacts.
3. It's expensive, so take care. Minor scratches can be rubbed out with products like "Mirror Glaze".

1. Select the parts depicted in the parts drawing. Untape the rolled up windshield and lay it out flat.

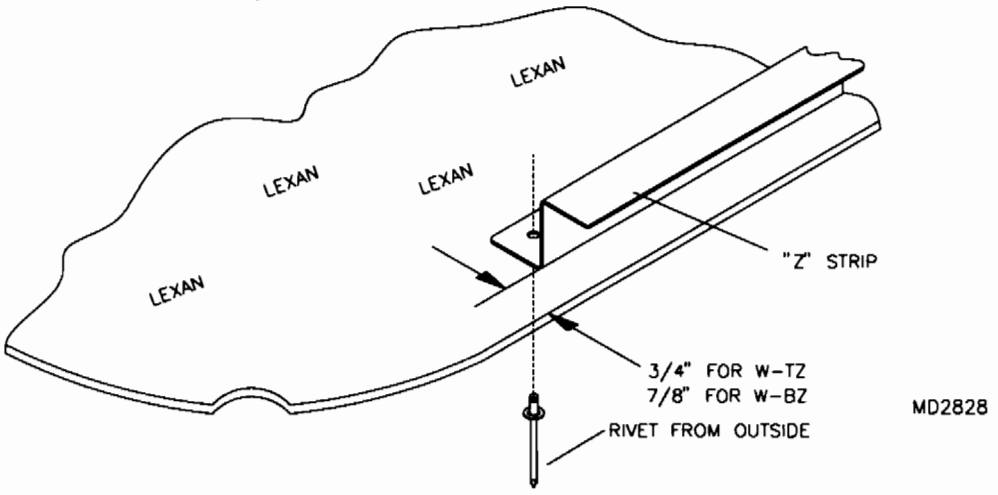
2. Observe the windshield. The side with the marks is where the "Z" strips are riveted onto. See **Figure 10-02**.

FIGURE 10-02



Align the "Z" strips on the marks as shown in **Figure 10-02**. Set back the W-TZ's from the lexan's edge 3/4 of an inch. Use a 7/8" set back for the W-BZ's. **HINT:** Use a combo square set at the dimension for the set back. See **Figure 10-02A**.

FIGURE 10-02A



3. Drill a #30 through the pre-drilled "Z" strip into the lexan and fasten with #30 copper clecos. After locating and temporarily fastening each "Z" strip to the lexan, number each strip and its location.

4. Remove the "Z" strips and peel back a 3" strip of the paper on each side of the lexan. **NOTE:** Make sure the "Z" strips are numbered and their location number is not peeled off.

5. Rivet the strips in place making sure no debris is trapped between the strip and lexan. The rivet heads should be on the **OUTSIDE** of the windshield.

NOTE: This completes the windshield assembly. Instructions for installation follow, but do not install until the fuselage is completed. The windshield is the last part added to the fuselage.

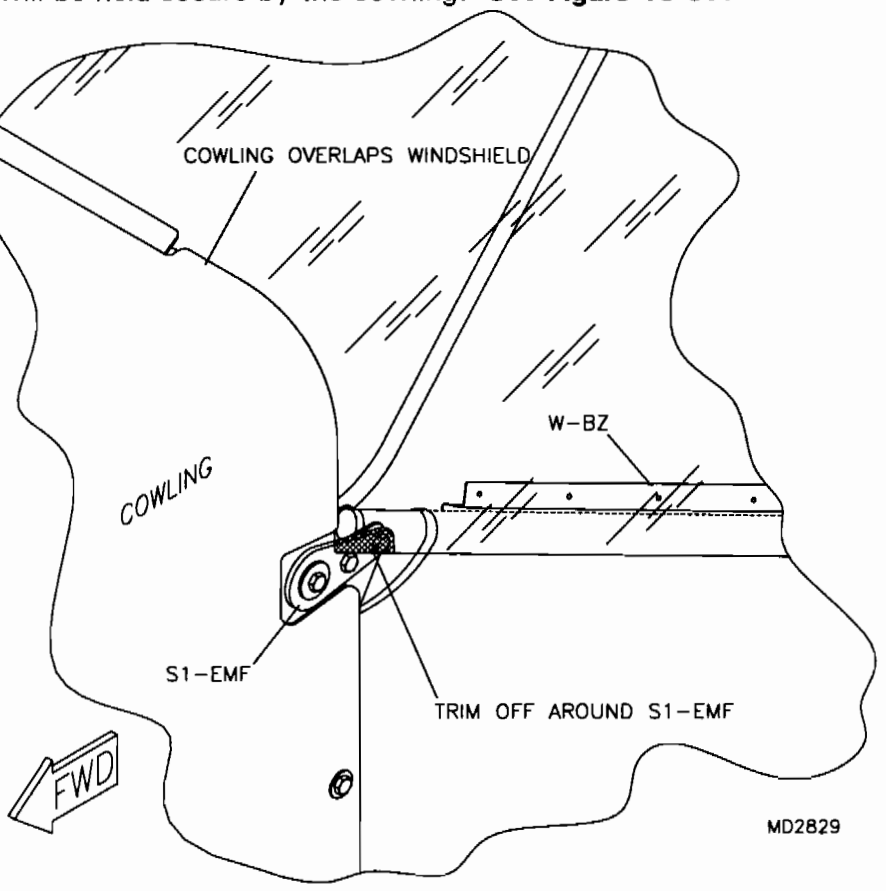
WINDSHIELD INSTALLATION

NOTE: Install the windshield permanently AFTER installing the instruments and electrical system.

6. Peel off only the inside paper, which is the "Z" strip side. Position the windshield with the top centering notch on top of the S-2 and bow up to slip under the firewall flange on the S-1. Center on the firewall by sliding it side to side. On one side, snap the bottom "Z" in place followed by the side and top. Repeat for the opposite side. The windshield will snap into place wtih a bit of muscle. Be careful not to bend the "Z" strips or cut your hands on the edges.

7. The windshield should fit snug all around its perimeter and under the cowling. If a bulge is present, check to see if the unit is centered on the firewall. Gentle bumping with the palm of your hand will encourage the windshield to settle in place. Once you're satisfied with the fit, trace over the S1-EMF on each side and pull away from the airframe to trim off with an aviation snips. Also, it may be necessary to trim away the lexan where it overlaps the bolts heads on the S-2 at the G-8 gusset plates. File the edges smooth, clean and snap back into place. **NOTE:** The curved front edge of the windshield will be held secure by the cowling. See **Figure 10-07**.

FIGURE 10-07



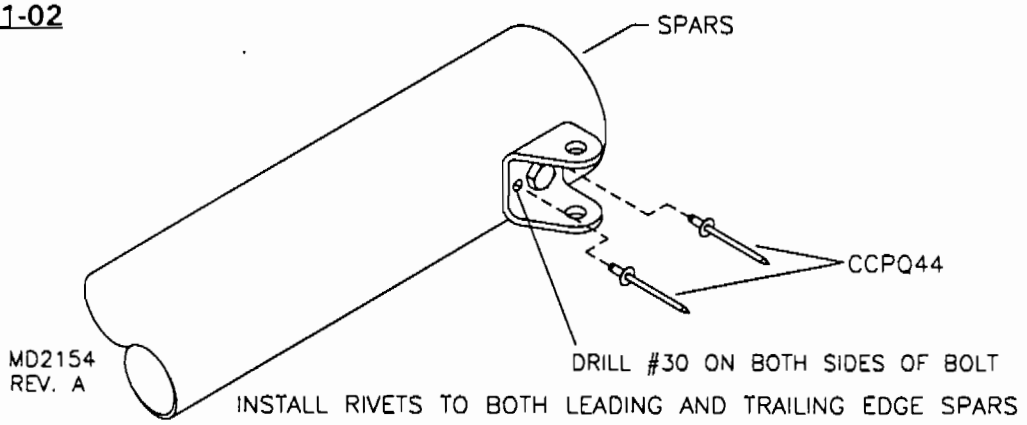
8. Peel off the outer paper once the wings are attached and the plane is fueled and readty to fly.

S-4/5 WING ASSEMBLY

1. Place the two trailing edge spars on a pair of saw horses. Refer to the parts drawing to reference the nut plate locations for the flap and aileron hinge bolts. Rivet the nut plates to each trailing edge spar placing them in-line with the spar. **NOTE:** Install a nut plate on each wing tip bow.

2. Refer to the parts drawing and select the proper tubes and hardware to assemble the compression and anti-drag tubes to the spars. Prior to installing outer compression tubes, position leading and trailing edge S2-SAB's so that bolt holes are vertical and install anti-rotational rivets as shown in the parts drawing and **FIGURE 011-02.**

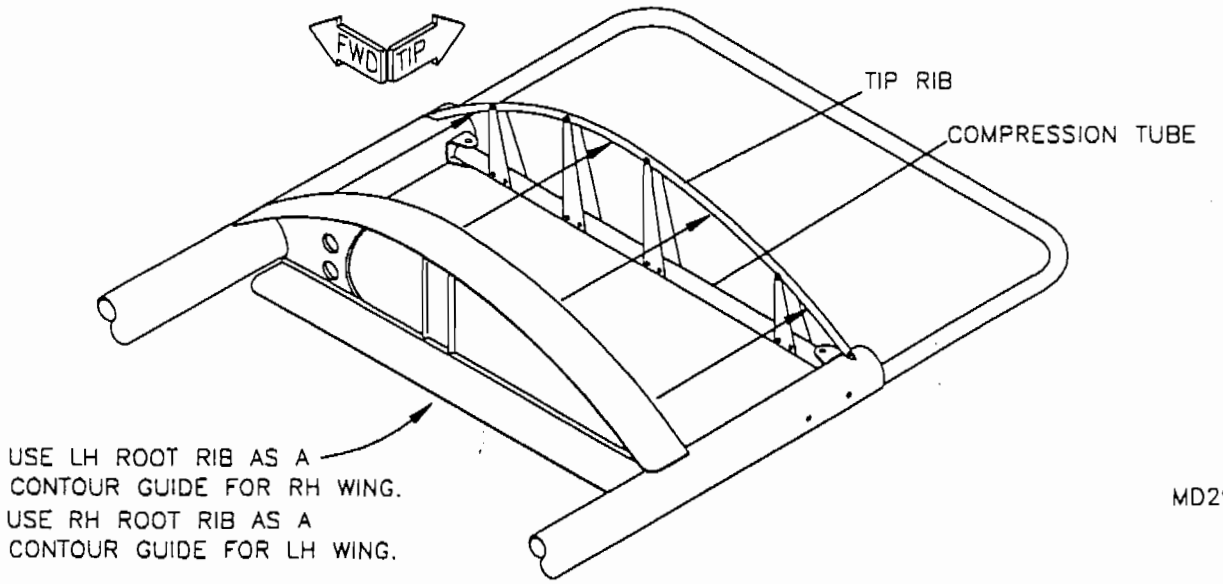
FIGURE 011-02



3. Insert the tip bow into the outboard end of the wing. Rivet the outer hole with a 3/16" stainless steel pop rivet. Position the tip parallel to the spar. Drill and rivet the second hole in the TIP. **IMPORTANT:** Before riveting, make sure the tip bow is against the inside of the spars.

4. A built-up rib needs to be installed to the outer most compression tube. Place the root rib used for the opposite wing between the spars at the tip up against the outer most compression tube. Use the rib as a "contour guide" to place the four tip rib supports. See **Figure 11-04**. Remove root ribs once the tip ribs are fitted with support ribs.

FIGURE 11-04

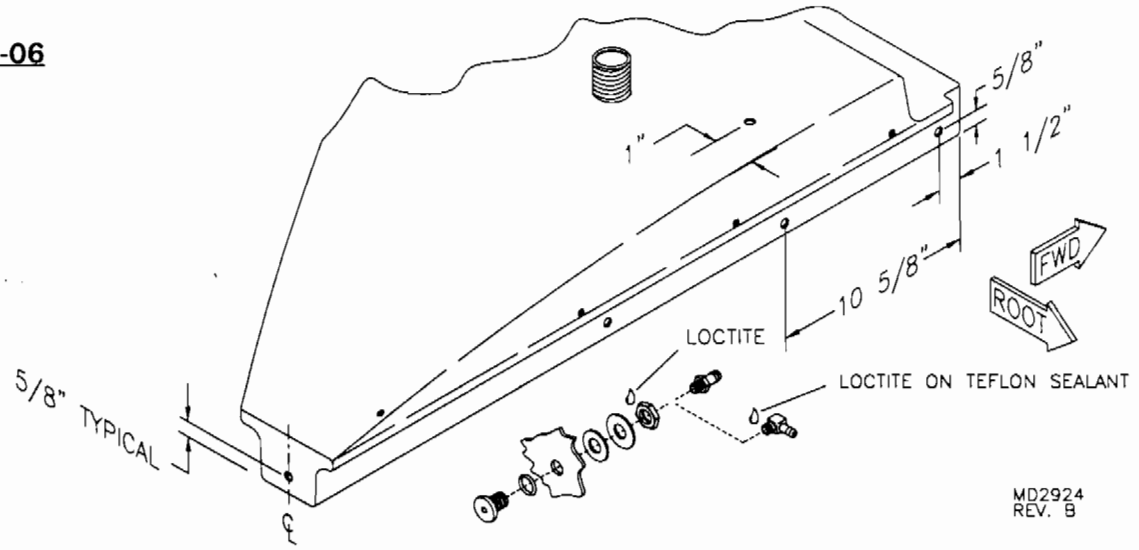


5. Assemble the aileron and flap (if applicable) teleflex retainers to the proper compression tubes.

FUEL TANK FITTING INSTALLATION

6. Locate ½" diameter holes for the fuel fittings at the locations shown in **Figure 11-06.** All fittings are located on the inboard side of the wing tank (see parts drawing for orientation). **NOTE:** When installing the forward 90 degree withdrawal fitting it must face aft. Debur all holes. Placing a wire in the fitting hole and up through the filler neck, attach a withdrawal fitting and o-ring to the wire. Make a loop in the end of the wire to keep the parts from falling off, then pull the fitting to the hole with the threaded portion out of the tank. Remove the wire. Holding the fitting with the threaded portion extended out of the tank, thread on the rubber washer, ½" washer and nut with loctite. **NOTE**: Use a 1/4" allen wrench to hold the tank withdrawal fitting while tightening the nut. Apply loctite to the straight or 90 degree fuel line fittings, and screw into the tank withdrawal fitting until snug. **CAUTION:** Do not tighten to the point the tank withdrawal fitting turns in the tank. Remove **ALL** shavings and loose debris from the interior of the tank. Use a vacuum to assist in removal.

FIGURE 11-06



7. Remove the rubber gasket and plastic baffle from the fuel cap. The plastic baffle will "snap" out of the fuel cap. A screw driver works well for the removal.

Locate and drill a 1/4" hole in the center of the fuel cap as shown in **Figure 11-07**. Install the conduit adjuster ferrule into the fuel cap. Apply a small drop of loctite and install the 1/4" plain nut and tighten to secure the ferrule into the cap. See **Figure 11-07A.**

FIGURE 11-07

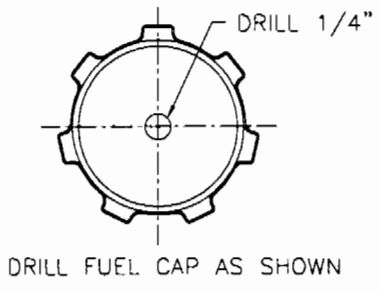
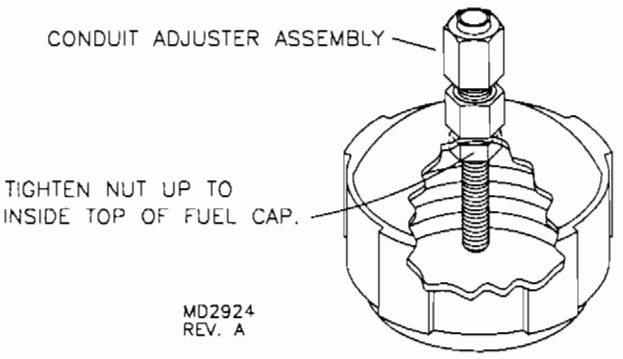


FIGURE 11-07A



8. With a side cutters or file, remove the attach nipples from the plastic baffle. See **Figure 11-08**. Drill a 1/4" hole in the center of the plastic baffle and install into the fuel cap over the adjuster ferrule stem. Drill a 1/4" hole in the center of the rubber gasket and install into the cap. Note the orientation of the rubber gasket.

Drill the 1/4" large wood washer as shown in **Figure 11-08A.** Assemble the bead chain to the bead chain retainer sleeve. Install the bead chain and retainer sleeve into the #30 hole in the large wood washer. Install the washer and bead chain into the fuel cap. Install the 1/4" shear nut on the adjuster ferrule stem and tighten.

FIGURE 11-08

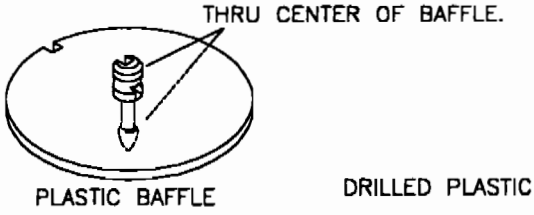
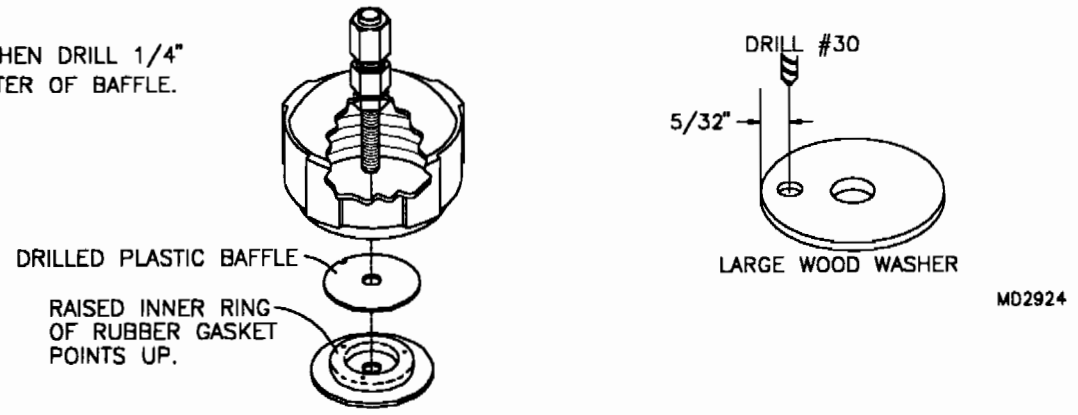


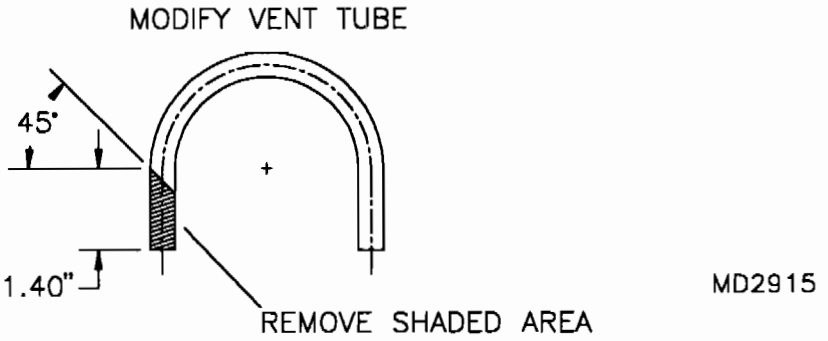
FIGURE 11-08A



9. Install the bead chain end coupling onto the bead chain. Find the center of the plastic retainer and drill a #30 hole. Using the brass backing washer, rivet the plastic retainer to the bead chain. Refer to the parts drawing.

10. Modify the vent tube as shown in **Figure 11-10.** Install the vent tube into the adjuster ferrule. Install the fuel cap assembly onto the tank and tighten. Position the vent tube so that the 45 degree angle is pointing forward (into the slipstream) and tighten the ferrule cap to secure the vent tube.

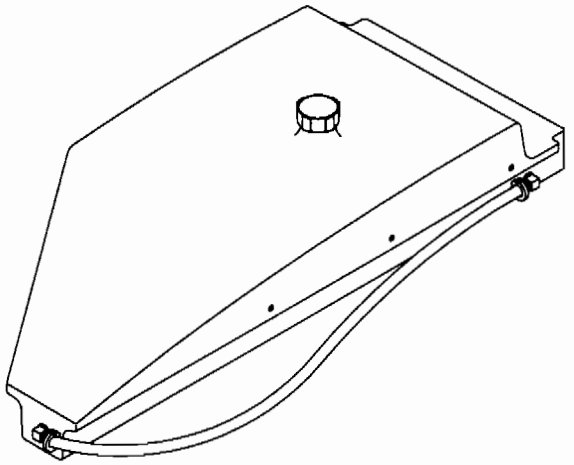
FIGURE 11-10



LEAK TESTING

11. This method has the advantage of rinsing out the inside of the tank. Install short segments of fuel line to the tank as shown in **Figure 11-11.** Fill the tank with water and inspect for leaks. Drain and let dry.

FIGURE 11-11

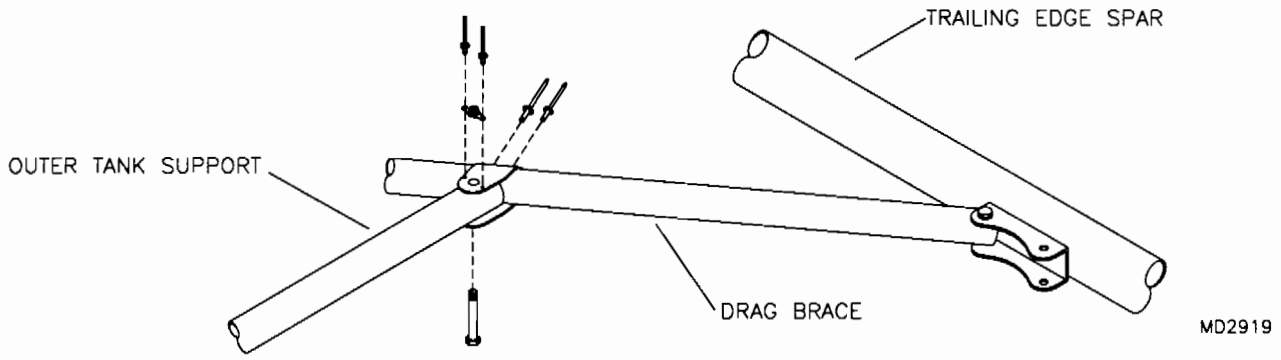


FUEL TANK MOUNTING

12. Locate the parts shown in the parts manual. Make sure the tank assembly steps shown have been completed before installing fuel tanks into the wing. On the aft side of the leading edge, project a centerline mark from the S2-SAB on the inner compression tube to about 17" outboard; this locates the centerline for the S2-SAB which retains the outer tank support.

13. Locate the tank to the wing frame, its forward side 1/8" against the leading edge spar and its inboard side against the inner compression tube. Locate an S2-SAB to the leading edge spar, 1/8" outbard of the fuel tank, transfer-drill #11 and rivet to the spar. **NOTE: When locating the S2-SAB, check that the tank withdrawal fitting will clear the inner compression tube once the tank is in position.** If necessary, the S2-SAB may be moved slightly farther outboard, allowing the tank to be positioned farther from the compression tube; if doing so, ensure that the tank remains properly supported by the compression tube. Bolt the forward end of the outer tank support to the S2-SAB, place the tank in position and pull the outer tank support parallel to the tank. Mark and cut the aft end of the outer tank support diagonally to meet the drag brace; *be careful not to cut the tube short.* Drill the aft end of the outer tank support #11 using the U-bracket as guide. Locate and drill two #30 holes through the aft side of the U-bracket and rivet the bracket to the drag brace; see **Figure 11-13** and the parts drawing. **NOTE:** The tank should fit rather loosely on the two tubes; it will expand with time and become snug in the mount.

FIGURE 11-13



14. Bolt the wing tank mount brackets to the fuel tank using the hardware shown. Notice the bent bracket bolts to the aft of the fuel tank on the inboard side. Using the tank mount brackets as a guide, drill the brackets and inner compression tube out to #30. Install the rivets shown on the parts drawing. Repeat this for the outer tank support. Once the tank installation is complete, apply loctite to the bolts which hold the tank in place. Repeat for the optional wing tank. Route the fuel lines as shown in the parts manual. **HINT:** For now, only tape the fuel lines in position. This will ensure proper routing without wasting zip ties. Zip tie lines in position during final assembly once satisfied with the routing. The fuel sight gauge will be hooked up after the wing is covered and root rib is in the forward position.

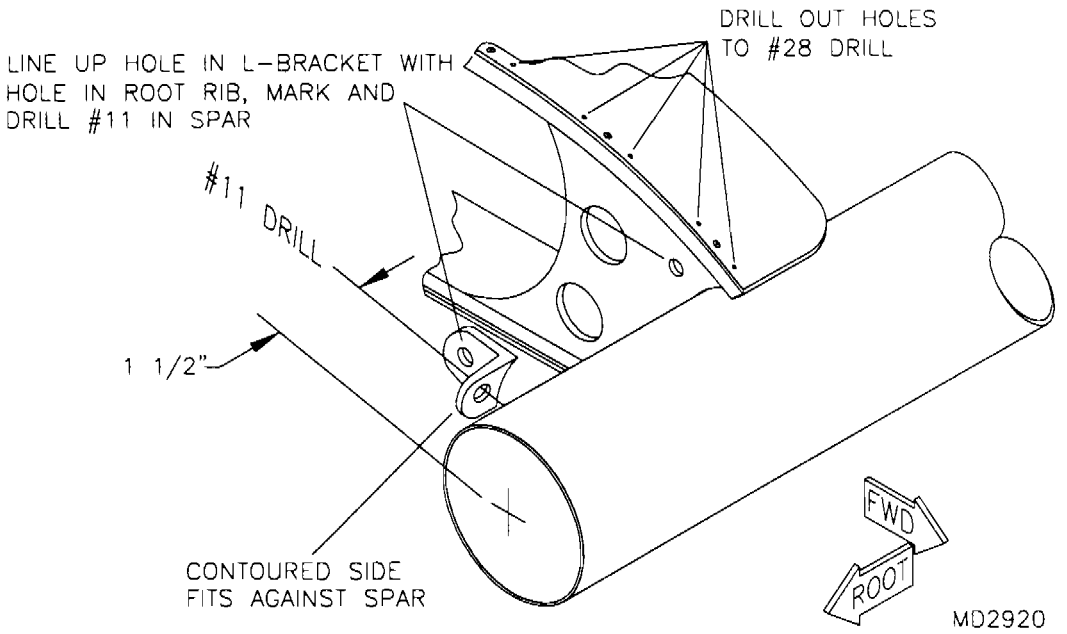
15. Install two 6" segments of 1/4" fuel line to the sight gauge fittings. The sight gauge will be completed after the wing covering is installed.

16. Install 1/4" fuel line and clamps to the fitting in the tank(s) with enough line to extend past the root of the wing by 12". The forward withdrawal fuel line must run parallel to the tank and to the trailing edge spar. Exit the root of the wing at the trailing edge spar leaving a 12" to 18" length of fuel line.

17. Place the left and right root ribs onto the root of the appropriate wing.

18. Refer to the root rib tensioning system parts drawing and select the "L" bracket and bolts required. Attach the "L" brackets to the spars with the contoured flange against the tubes and the upright flange outward. See **Figure 11-18.**

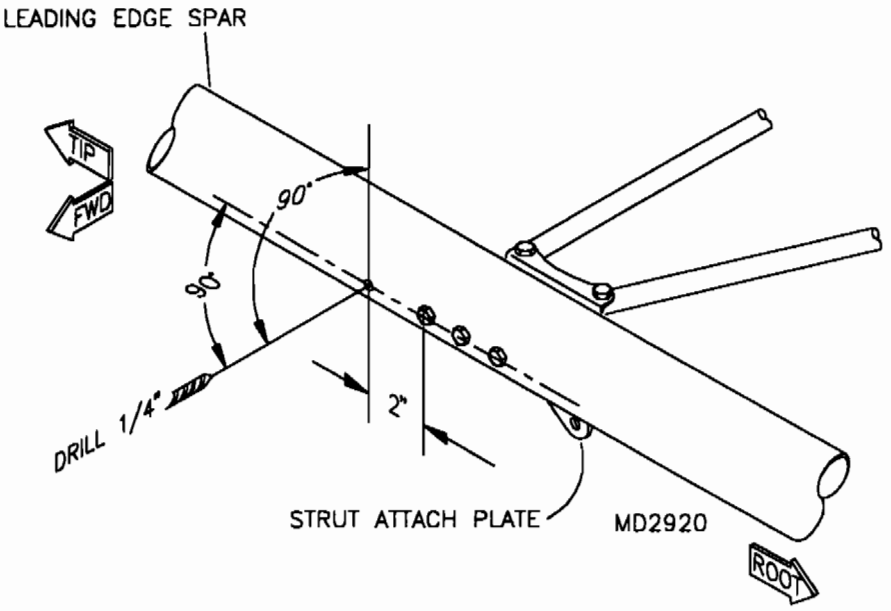
FIGURE 11-18



19. Place the all-threaded 1/4" bolts through the "L" brackets and into the holes on the root ribs as per the parts drawing. Finger tighten the nuts onto the bolts. Install the rubber grommets into the root rib for the fuel gauge.

20. On the right wing forward spar, drill a 1/4" hole 2" outboard of the outer-most lift strut bolt. Drill through the spar square with the strut attach plate and 90 degrees to the spar when viewed from the top. See **Figure 11-20.**

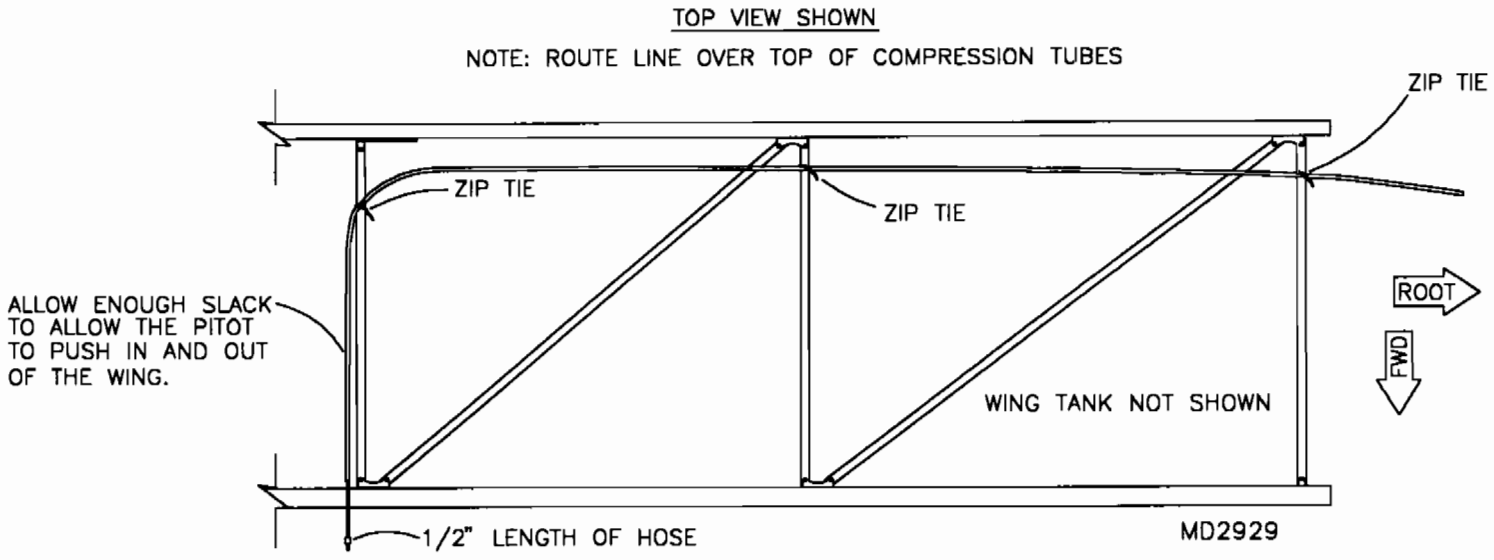
FIGURE 11-20



21. Insert the pitot tube into the hole with a 1/2" length of 1/4" fuel line placed on the end. This prevents the pitot tube from being pulled into the wing. With a clamp and 14' of 1/4" fuel line, clamp the line over the inside end of the pitot tube. Tighten the clamp with a pliers.

22. Route and secure the line with 3 zip ties as shown in **Figure 11-22.**

FIGURE 11-22

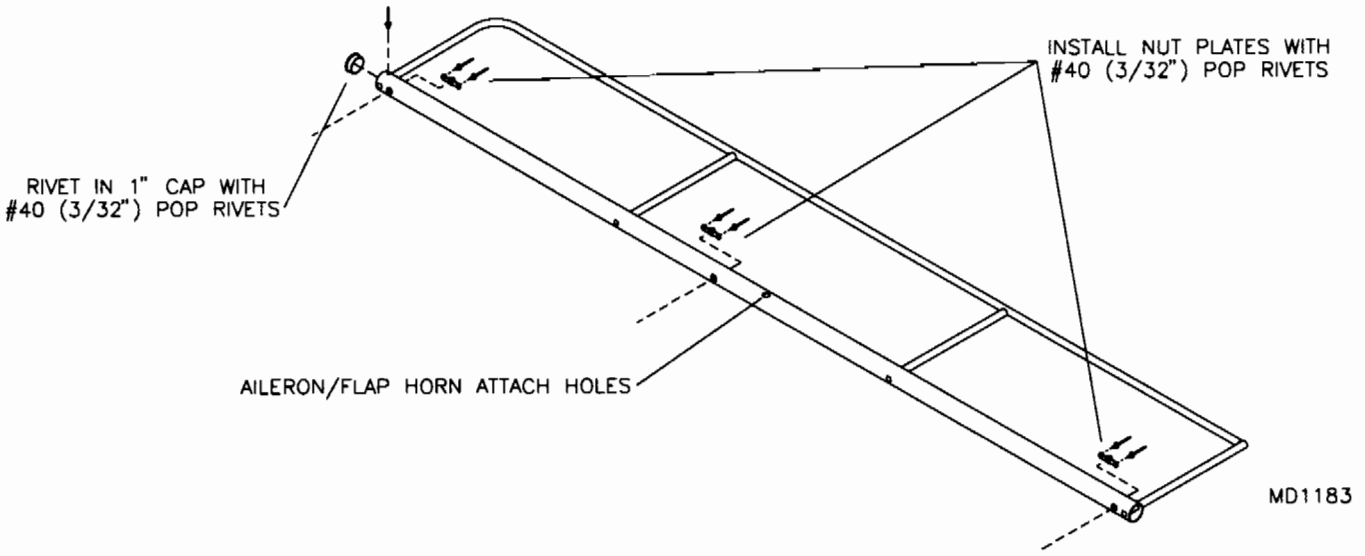


23. Connect the line to the pitot line coming from the ASI with a straight barb. Push the pitot tube into wing to stow. **IMPORTANT:** Pull out the pitot tube from the wing prior to flight.

S-4/5 COYOTE FLAP & AILERON ASSEMBLY

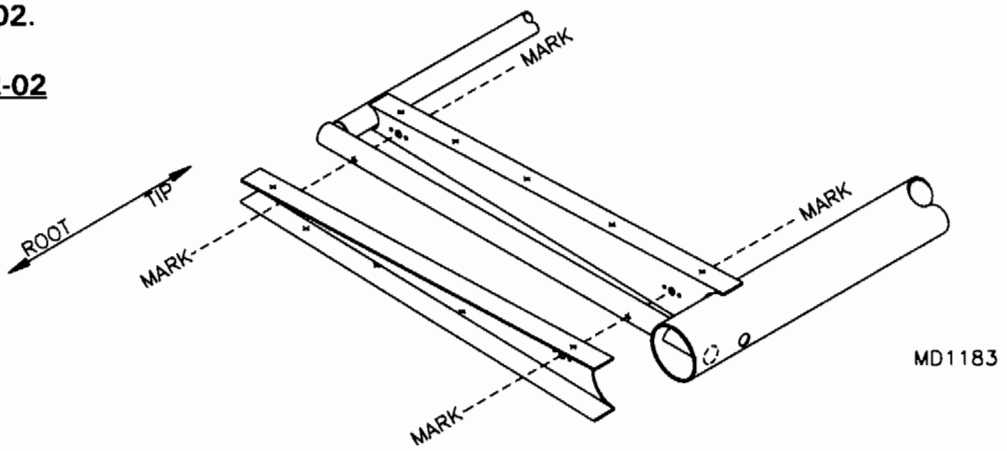
1. Inspect the aileron frame before covering. File smooth any rough spots and clean the frame, your hands and tools before skinning. Install the 1" cap on the tapered end and rivet with a 3/32" aluminum pop rivet. See **Figure 12-01**.

FIGURE 12-01



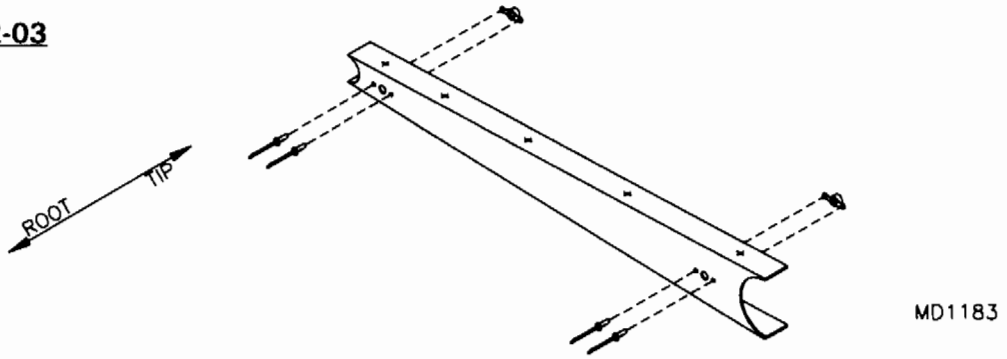
2. The ailerons and flaps need to be drilled for the tensioning rib. Set the rib against the 1/2" tube rib on the inside of the frame and mark and drill the two #11 holes. Place the rib on the outside of the tube and mark and drill #11. Make sure the rib is tight against the spars before locating the holes. See **Figure 12-02**.

FIGURE 12-02



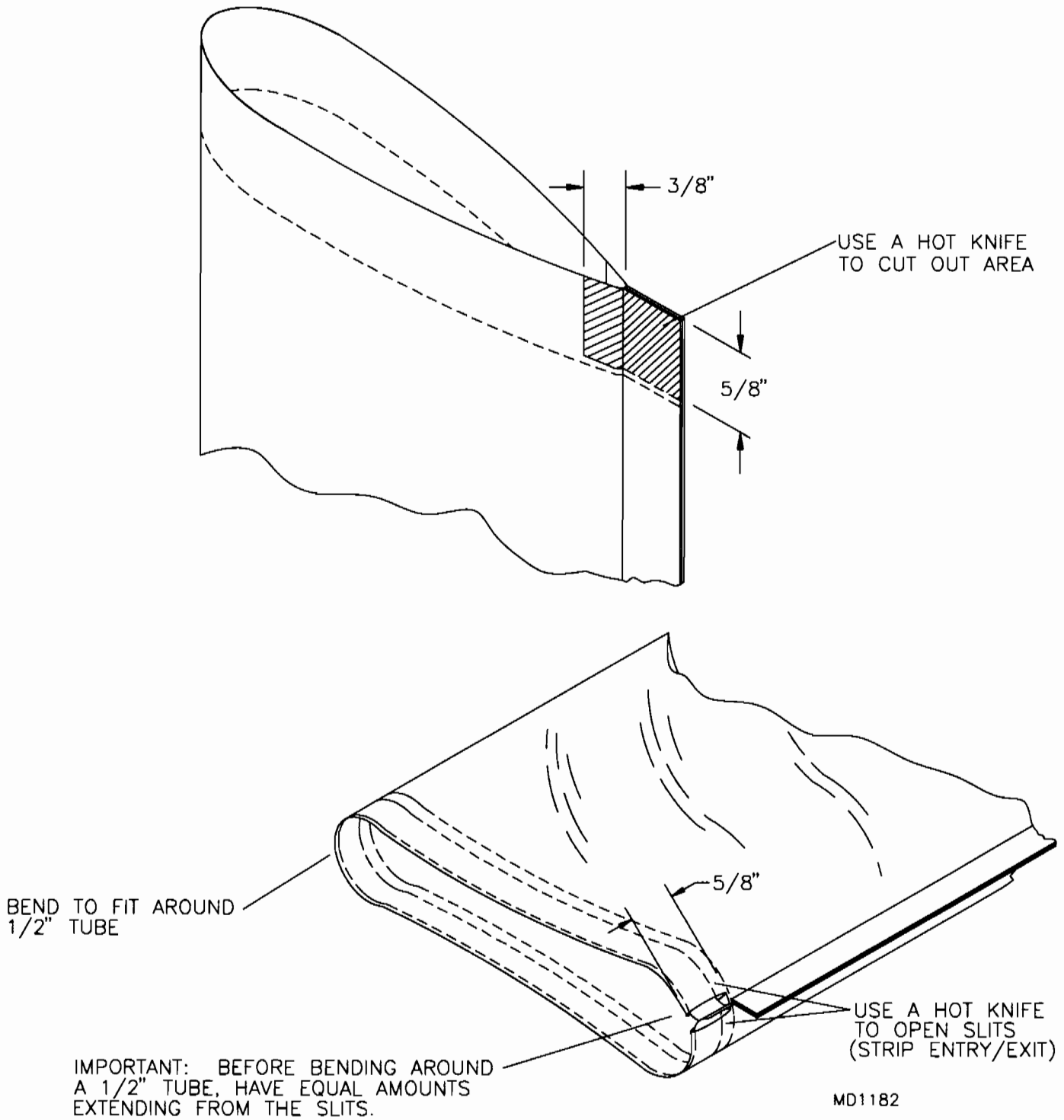
3. Rivet the 3/16" nut plates to all hinge holes in the flaps and ailerons. Rivet the two 3/16" nut plates to the inside of each aileron flap tension rib. See **Figure 12-03**.

FIGURE 12-03



4. Cut a small notch in the pocket end of the cover. Cut a notch back from the velcro on each side, a little less wide than the pocket. Do not cut into the stitches. See **Figure 12-04**. This will allow entry and exit of the aluminum strip. With the strip inserted with equal amounts extending out of the fabric, bend it at the point where the trailing edge will contact.

FIGURE 12-04



5. Slip the pre-sewn skins over their respective frames. The skins will fit tight but they will go on. Some helpful methods follow. If your skins are really tight, try a very small amount of silicon lubricant spray.

6. Brace the opposite end against a wall to push against as you pull on the skin. (A) After about half way on pull the skin down from the top. This will scrunch it up, but now you will have less tension to pull against. (B) In extreme cases where the skin is too tight, (it will be evident by the bowing in of the trailing edge between ribs) file a little off the ribs at the buttons. **CAREFUL** it is real easy to remove too much.

7. With the fabric pulled down as far as possible, install the tension rib in the fully extended position. Rivet the fabric to each side of the rib with five evenly spaced rivets. See **Figure 12-07**. Turn the screws tight to tension the fabric. The proper amount of tension is reached when the rib bottoms against the 1/2" tube. See **Figure 12-07A** for a view of the finished product. Note how the metal strip is trimmed and formed around the spar. Overlap the metal strip and rivet to the spar as per **Figure 12-07A**.

FIGURE 12-07

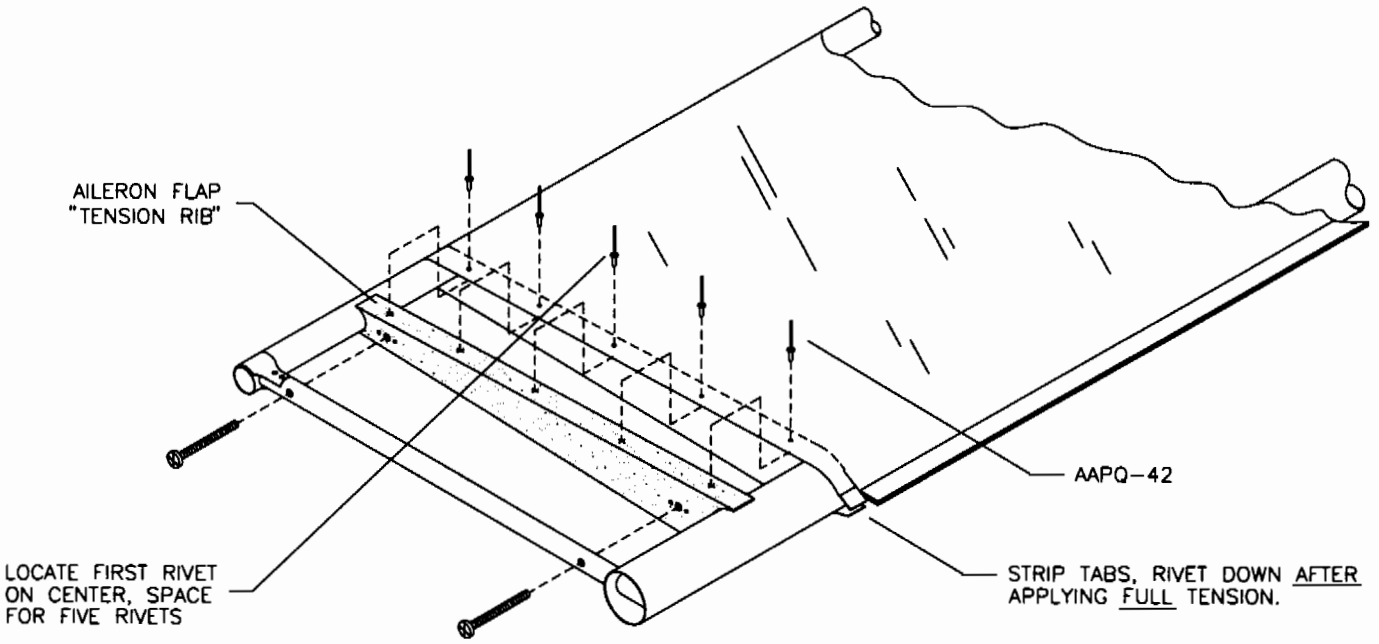


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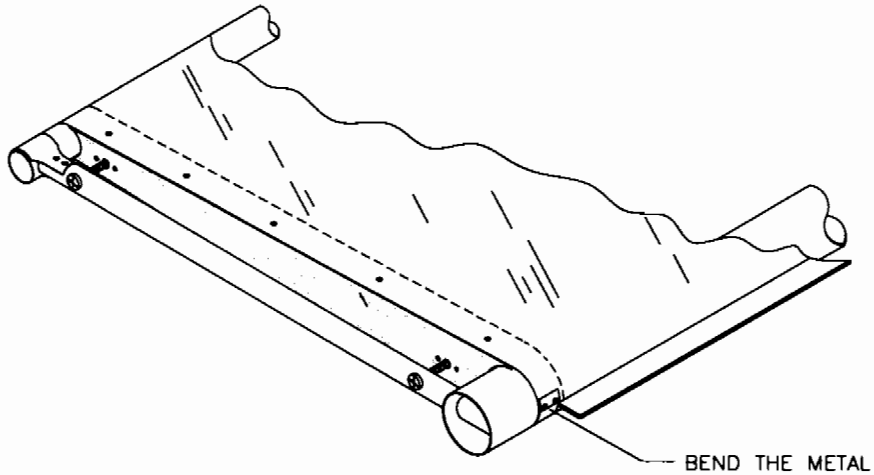
FIGURE 12-07A



8. Melt through the hinge points and horn attach angle bolt holes. When attaching the horn attach angles, be sure they are 90 degrees to the wings leading edge spar. **Figure 12-08** shows details on how to install the aileron clip and bushing. At each hinge point, cut out as shown in **Figure 12-08A**. **BE CAREFUL** not to cut into the stitching.

FIGURE 12-08 AILERON CLIP INSTALLATION

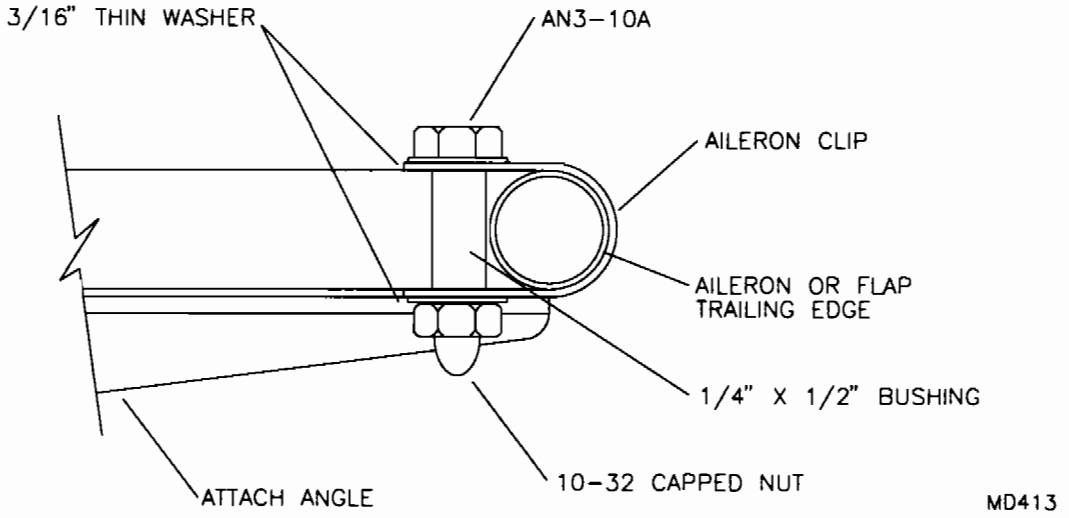
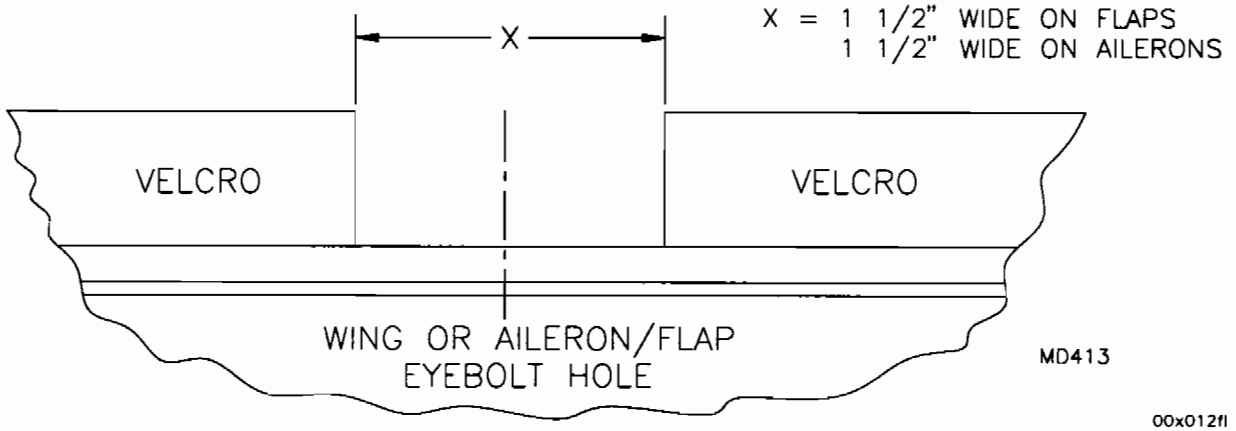


FIGURE 12-08A



INSPECTION OF THE AIRFOIL LIFT STRUT

RANS airfoil lift struts are made of extruded aluminum. Extrusions of this nature are sensitive to deformation. Cracks and splits can occur along the length of the strut if the ends are compressed beyond the material limits. Over-tightened bolts can cause cracking. A compression bushing or fitting large enough to equal the struts inside diameter should be used. Remove any burrs on the bushings.

Each piece of strut material is inspected twice before shipment to assure you of a quality product. However, we are not infallible, therefore, we encourage you to inspect your struts for any deformation or surface imperfection. Deeply grooved struts should not be used and returned to the factory for replacement. The surface should look and feel smooth.

Dents and nicks can occur during shipping. The strut material is very thick skinned and resistant to dents. If dents are present they will usually be large enough to require rejection of the material.

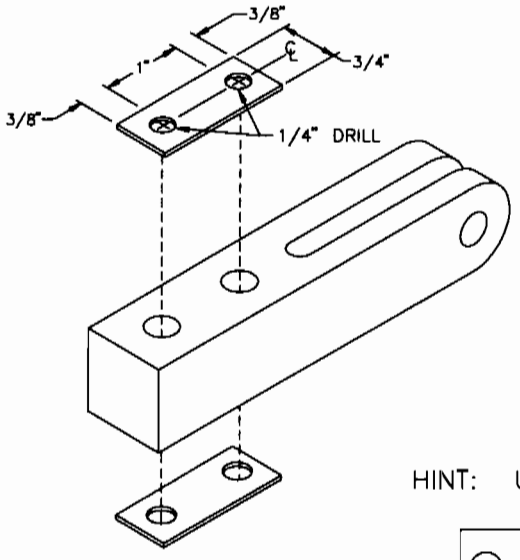
Minor nicks and scratches can and should be sanded out with 250, 350, and finally 400 grit wet or dry sandpaper. Sanding out such defects is an effective way of restoring the strut to a safe full strength status. Any nicks or scratches that require more than light sanding are cause for rejection.

Once the struts are in service, continued inspection is the only required maintenance. Anodized strut material is resistant to corrosion and needs little care. The inside of the strut can be protected by pouring a quantity of paint inside the strut and rotating to cover the entire surface.

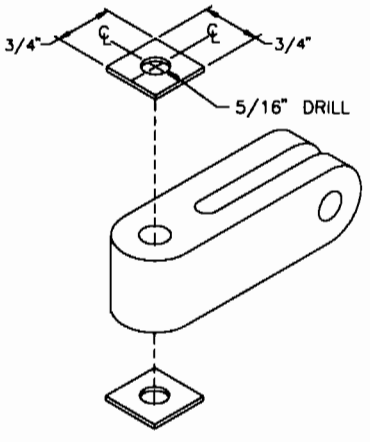
Include strut inspection in your pre-flight.

NOTE: Due to dimensional variation in extruded material it may be necessary to shim the strut fittings. No gap should exist between the fittings and the struts. If a gap exits, **IT SHOULD NOT BE ELIMINATED BY TIGHTENING DOWN THE BOLTS.** This action may crack the struts. Instead, fabricate and use the .020 shim material between the fitting and the strut. Refer to the following drawing.

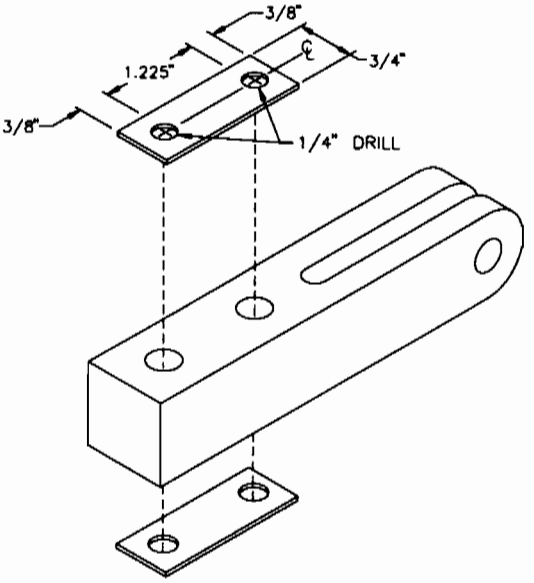
UPPER FWD STRUT SHIM



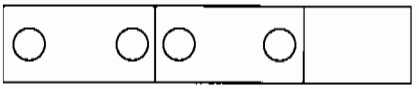
UPPER AFT STRUT SHIM



LOWER FWD STRUT SHIM



HINT: USE CONNECTOR AS TEMPLATE



HINT: DRILL HOLES IN SHIM STRAP THEN CUT TO LENGTH. MAKE AS REQUIRED.

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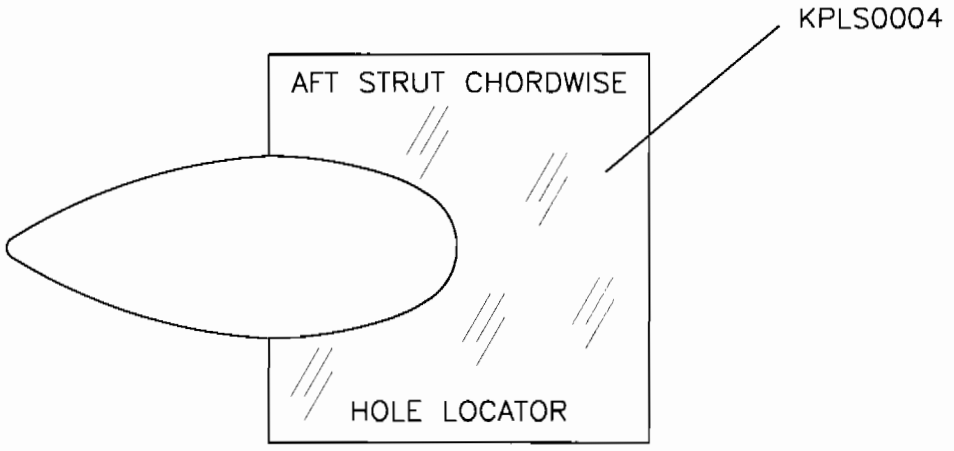
S-4/5 AIRFOIL STRUT INSTALLATION AND SETTING WING WASH OUT

PLEASE NOTE: It is assumed the wings are assembled but not covered, and the fuselage is sufficiently complete.

With the help of a friend and two step ladders (or similar devices, about the height of the main spar carry through), bolt the wings to the fuselage. Hold up the tips with the ladders.

1. Use the template as shown in **Figure 13-01** to locate the holes chordwise on the struts.

FIGURE 13-01



2. Select from the parts the two 101 ½" lengths of strut material. Locate and drill a 1/4" hole 5/8" in from each end. Drill a second hole using the connectors as a guide. See **Figure 13-02**. Drill a 1/4" hole for the jury strut 56 5/16" from the lower end. See **Figure 13-02A** for the hole locations. Use the template **Figure 13-01** to locate the exact position of the holes cross wise on the struts. Assemble the lift strut connectors to each end as per the parts drawing. Install the gusset plates using **Figure 13-02B** and **Figure 13-02C** as a reference. **NOTE:** Rivet the gusset plates to the forward lift strut with 3/16" stainless steel pop rivets.

FIGURE 13-02

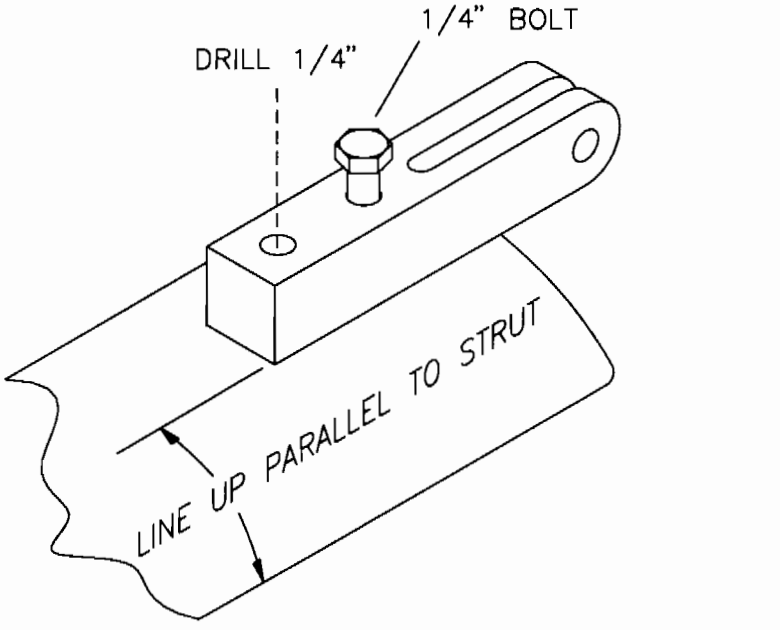


FIGURE 13-02A

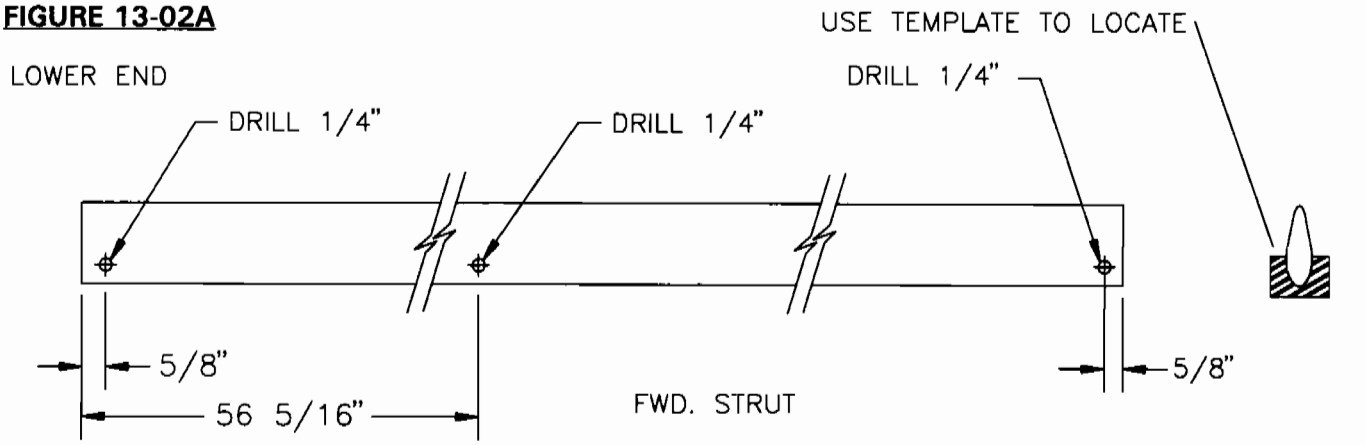


FIGURE 13-02B

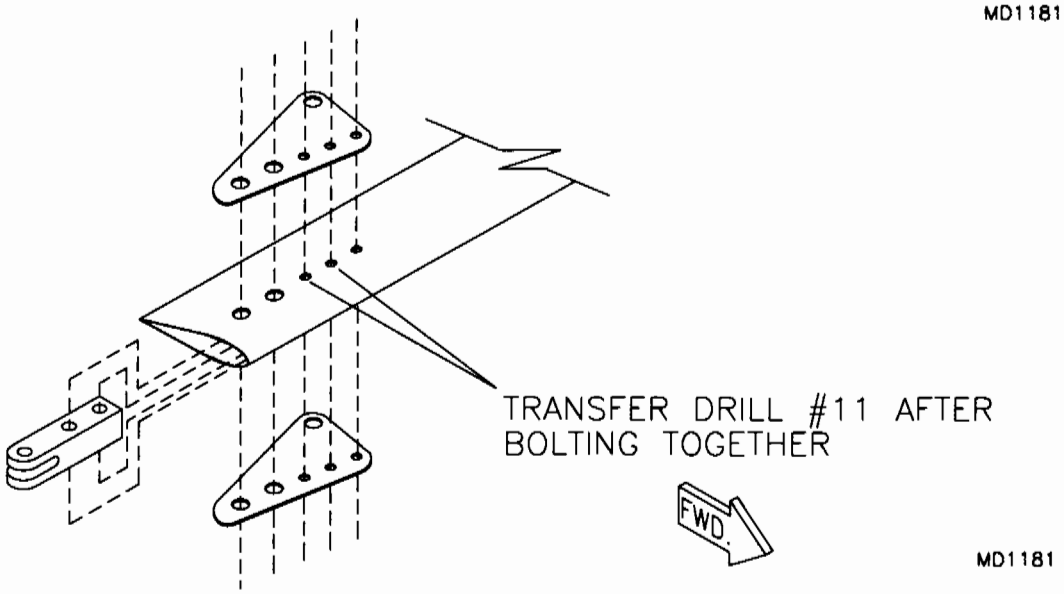
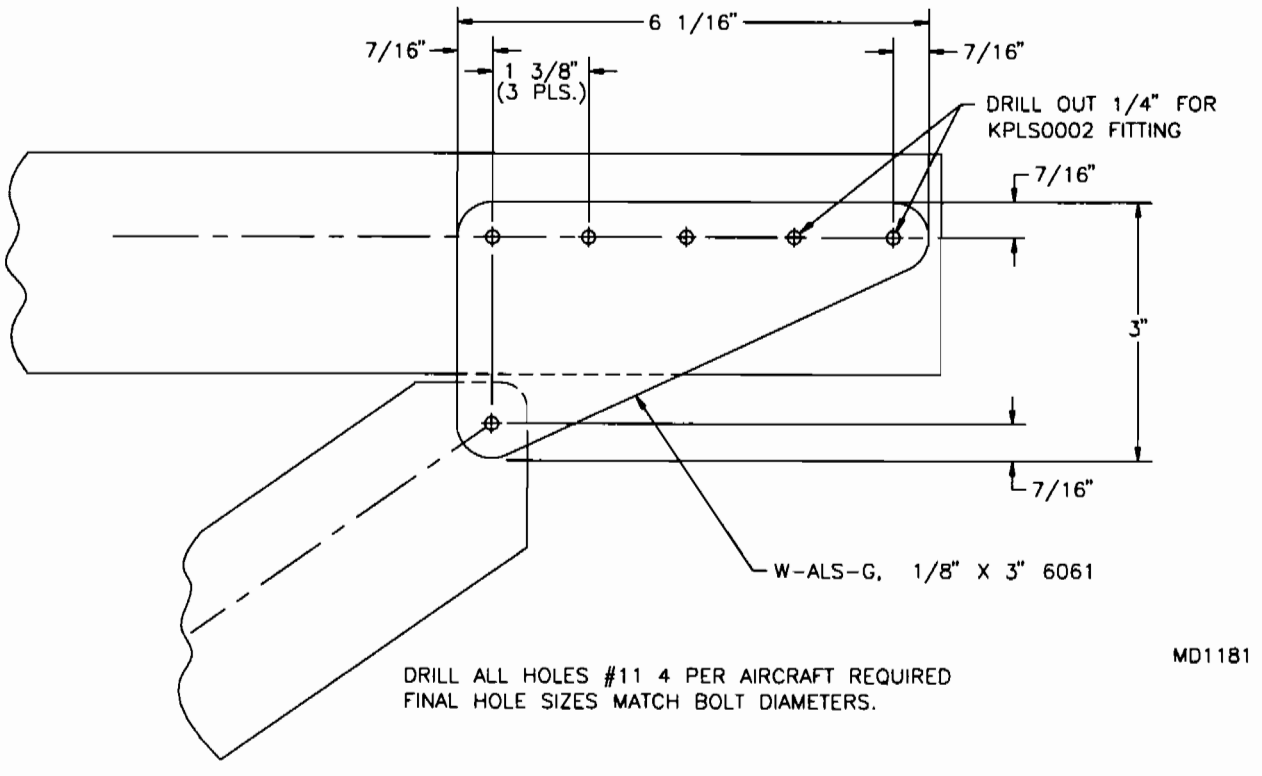
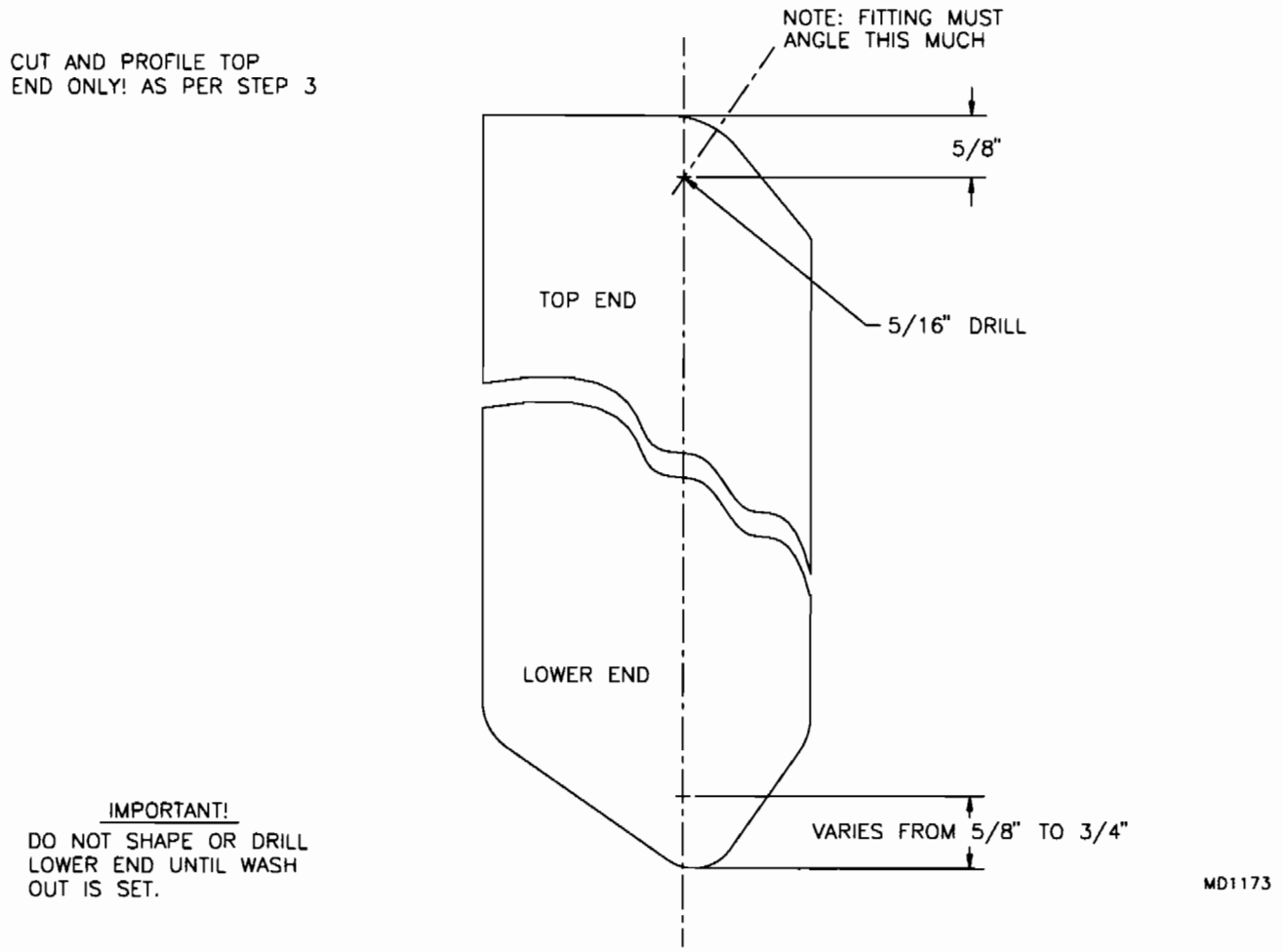


FIGURE 13-02C



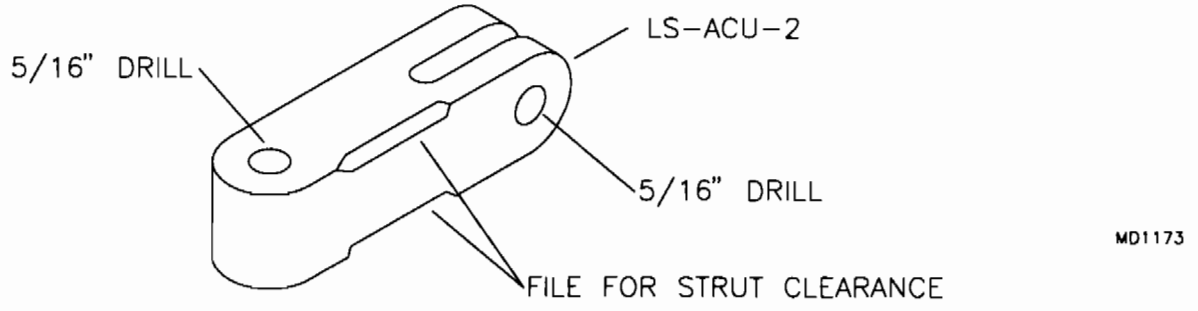
3. Cut, profile and drill the AFT lift struts on one end only to the **TOP** end profile as per **Figure 13-03**.

FIGURE 13-03



4. Take the (2) LS-ACU-2 slotted lift strut connectors and file a clearance into the connector as required to fit into the strut at the required angle. The angle line is shown in **Figure 13-04**. Drill the holes in the connector out to 5/16".

FIGURE 13-04



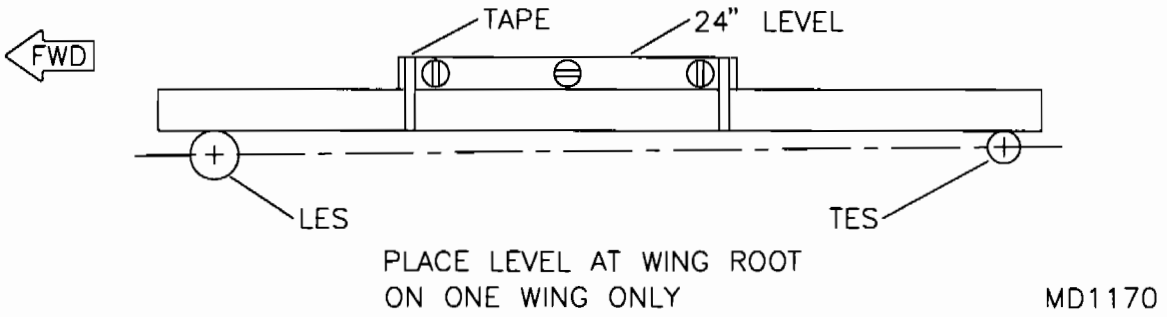
5. Bolt the connectors into the AFT lift strut top ends. Bolt to the wing and check for clearance. The connector must fit to the strut attach plate without binding against the strut.

6. Bolt the FWD lift struts in place with the AFT lift strut gussets pointing AFT. This will automatically set the dihedral. Pin the strut to the fuselage's strut attach plate.

7. Bolt the AFT lift struts to the wing and place the lower unshaped and undrilled end between the gussets. **PLEASE NOTE:** The wash out will be set by twisting the wing. The AFT strut will be clamped and drilled at the gusset once the wash out is set. The gusset will act as a drill guide. Mark a line for several inches at the strut's lower end showing chordwise location for the hole.

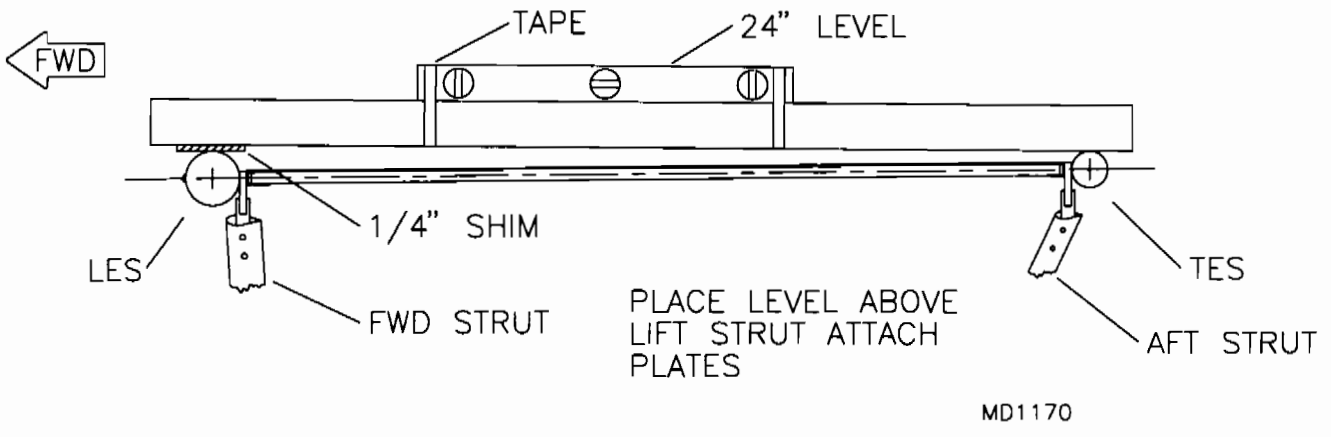
8. Make a rigging level by taping a 2 foot level to a straight 50" long, 2" X 3/4" board. Place the level on the wing's topside at the root. The level should be held against each spar. Raise the main gear until it reads level. **CAUTION:** Block the wheels to prevent rolling. Double check the level prior to step 9. See **Figure 13-08**.

FIGURE 13-08



9. Cut out a scrap of 1/4" plywood 6" X 2" and nail or screw it to one end of the straight edge. Place the rigging device just outboard of the right wing's strut with the 1/4" block on top of the FWD spar. See **Figure 13-09**. This will set the "wash out". Move the AFT spar up or down as required to obtain a level reading. Use a vise grip type "C" clamp to hold the setting. Check for accuracy before drilling. Mark on the fitting with a pencil where the lower end of the strut is. Use the gusset fitting to line up on the mark and the chordwise marks to drill the bolt hole. Drill 5/16", then assemble. Be sure to place the anti-crush bushing on the inside of the AFT strut lower fitting. Remove the pencil marks afterwards or the graphite will cause corrosion.

FIGURE 13-09

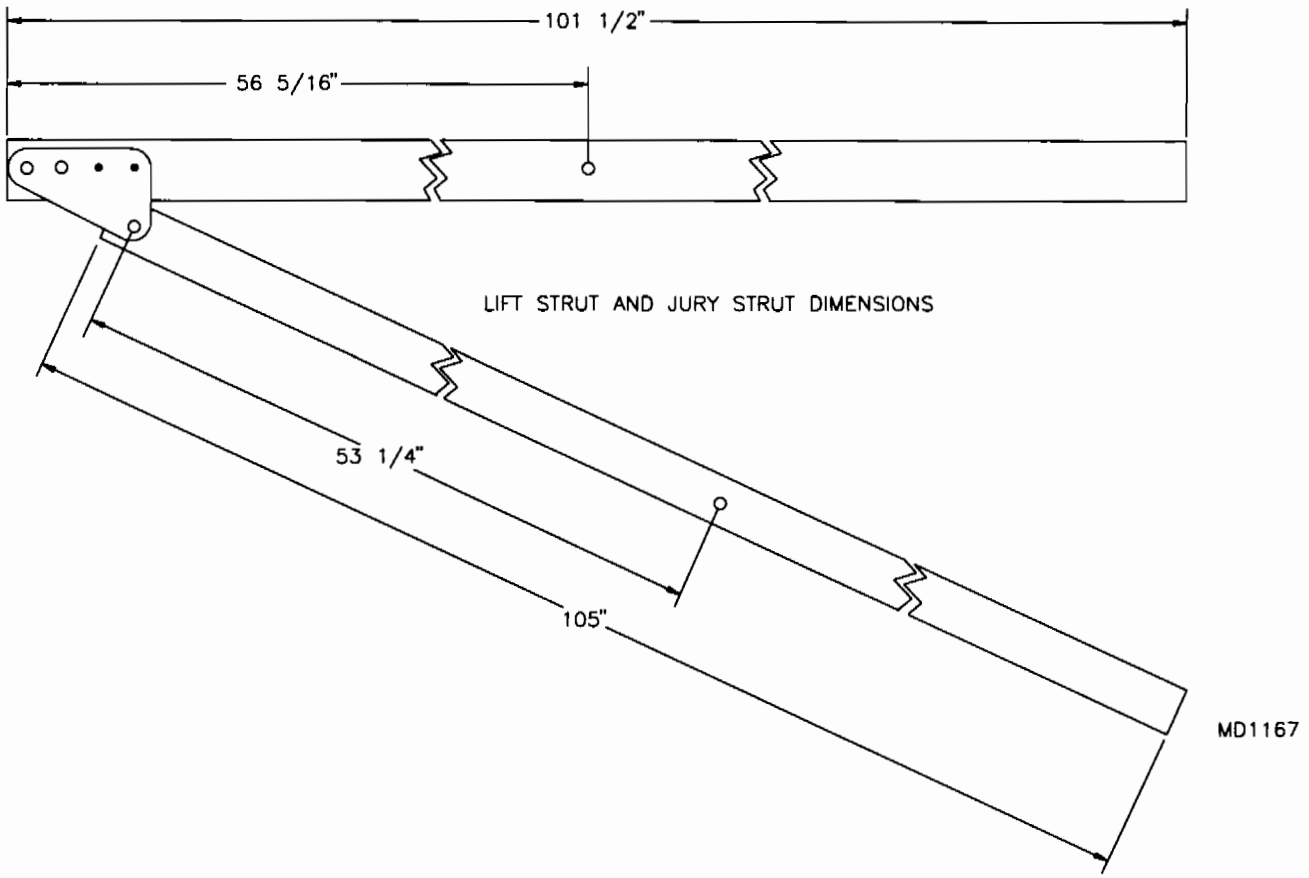


10. Go directly to the other wing's outboard strut location and set the wing. It is not required and can even result in an improper setting if another level reference is taken from the other wing root.

11. If everything is done accurately, the aircraft will not have any tendency to drop a wing in a stall or not hold heading. If these bad manners are prevalent and it is discovered, the wings are not set properly. It is a simple matter of installing and drilling a new AFT lift strut connector. Otherwise, it could be unequal flap or aileron settings. Raise or lower the flaps as required. (**EXAMPLE:** If the plane pulls to the right lower, the right hand flap slightly or raise the left.) Do not forget to consider engine alignment if the plane does not fly straight. (See engine.)

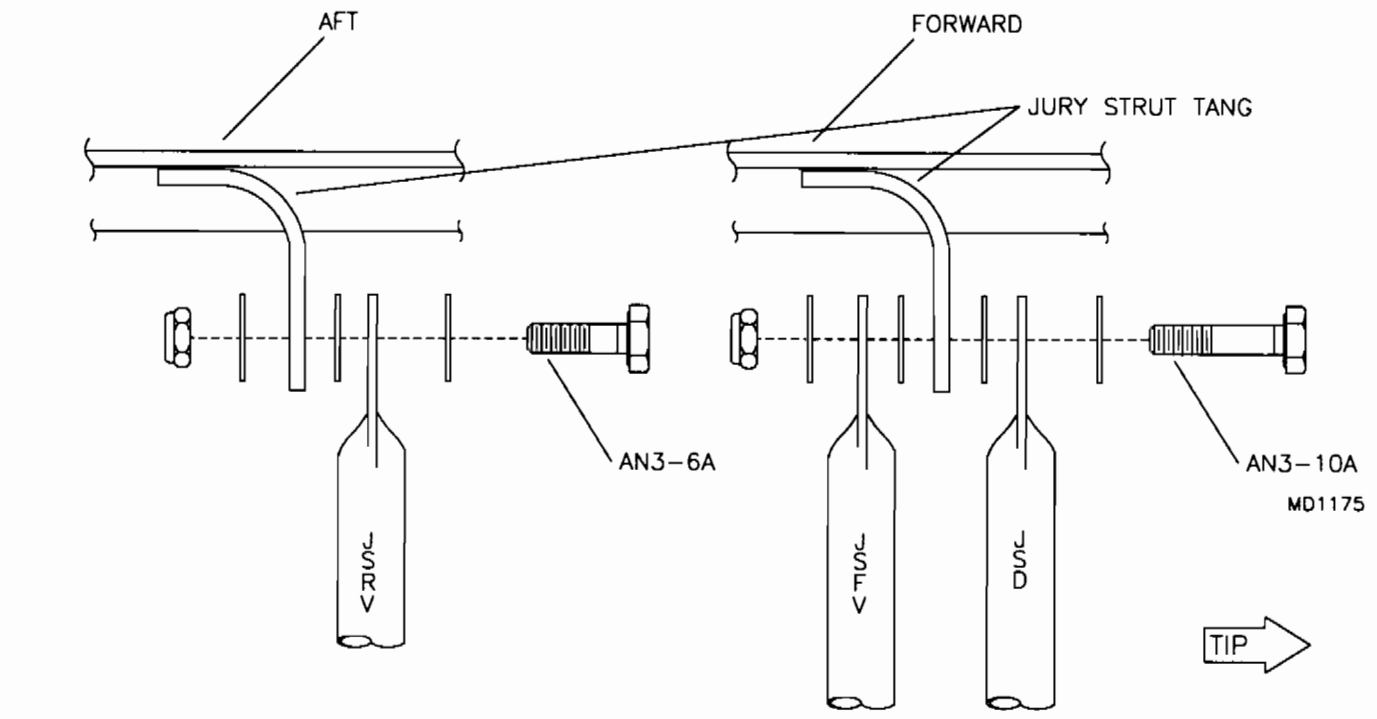
12. Locate a 1/4" hole through the AFT lift strut for the jury struts eyebolt 53 1/4" from the bottom 5/16" bolt. Use the template to locate chordwise on the strut. See **Figure 13-12**.

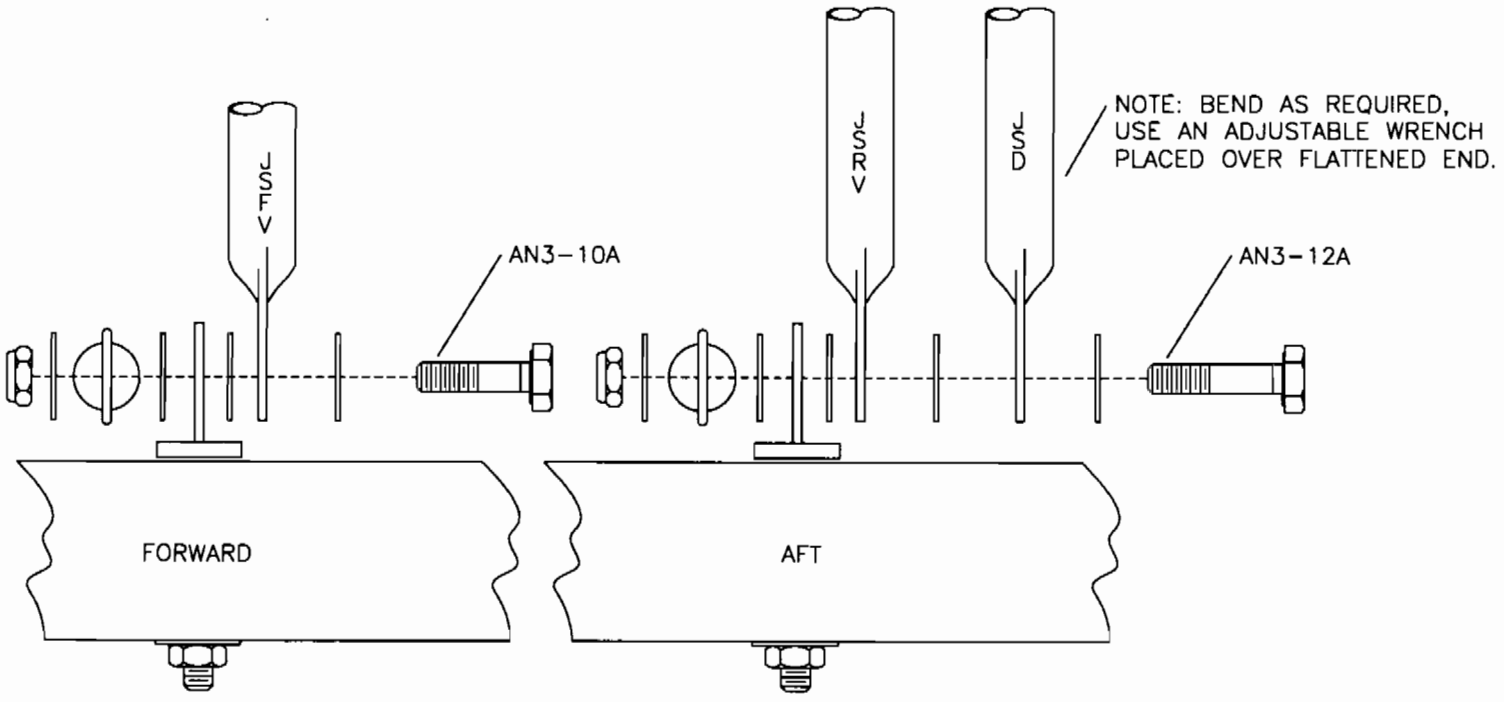
FIGURE 13-12



13. Bolt the 1/4" eyebolt in place and turn the edge to slipstream. Bolt the jury struts to the wing tabs as shown in **Figure 13-13**. The lower ends are not drilled or bent. The FWD and AFT jury struts will need to be bent to line up with the eyebolts. Use an adjustable wrench opened just enough to slip over the smashed end. Once the jury struts are lined up, transfer drill through the eyebolts. **NOTE:** Pre-mark and move aside to drill (otherwise the struts will be in the way). Be sure you do not force the fit of the jury struts or bowing of the lift struts may result. Refer to the parts drawing for the bolting sequence. File the ends of the jury struts as required to make fit. For quick part reference, the shortest struts are the crossing strut, the second shortest are the FWD verticals. The 29 ½" is the diagonal and the 29" is the AFT vertical.

FIGURE 13-13


AFT
FORWARD
JURY STRUT TANG
AN3-6A
AN3-10A
MD1175
FSJV
DSJV
TIP


FSJV
AN3-10A
RSJV
DSJV
NOTE: BEND AS REQUIRED, USE AN ADJUSTABLE WRENCH PLACED OVER FLATTENED END.
AN3-12A
FORWARD
AFT
MD1175

COVERING THE FUSELAGE

IMPORTANT!! Be sure that you have thoroughly inspected the fuselage before proceeding.

1. Prepare a 10 ft x 18 ft work area with the following requirements:

   A. A **VERY** clean floor or preferably carpet.
   B. Two saw horses to rest fuselage on.
   C. Super clean hands, tools, clothes and a helper likewise equipped.

2. For **taildraggers**: Support the fuselage on its completed landing gear.
   For **trikes**: Remove the gear and support on the saw horses.

3. Position the cover with the tailcone S-3 opening at the end of the fuselage.

4. Lift the tail gently and pull the cover forward. **DO NOT** force it. If a snag develops, stop and investigate. Work the cover over the tailcone doing so without dragging your hands over the fabric. This will only crease and dirty the skin. (The metallic nature of the skin material requires special handling. Avoid soiling, rubbing it with your hands, stepping on or crunching it. The fabric will show if it has been roughly handled. **BE CAREFUL**!) Always pull the covering from the edges to position. Make certain that as you work the cover over the structure that it is centered. This is indicated by the location of the side stripes. They should align parallel and evenly from side to side with the top tailcone longerons. The same amount of stripe should appear above the longeron tubes on each side.

5. Mark the lacing hole locations on each strip as shown in **FIGURE 014-05**. Use a soldering iron (or hot knife with a point) to make a slot. Cut to length and install the lacing wires into each pocket in each lace up strip. Bend a hook on each end of the wires to prevent movement. Refer to **FIGURE 014-05A**. Wrap the lace up strips around the bottom longerons at each respective location. Refer to the parts drawing and **FIGURE 014-05B**.

FIGURE 014-05

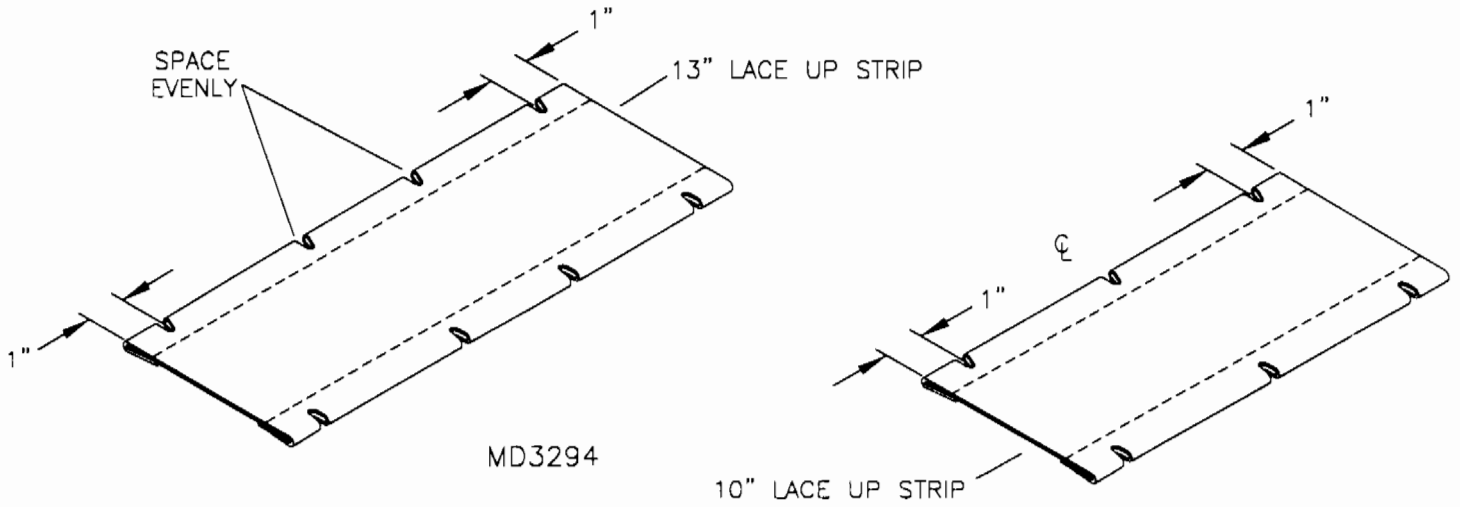


FIGURE 014-05A

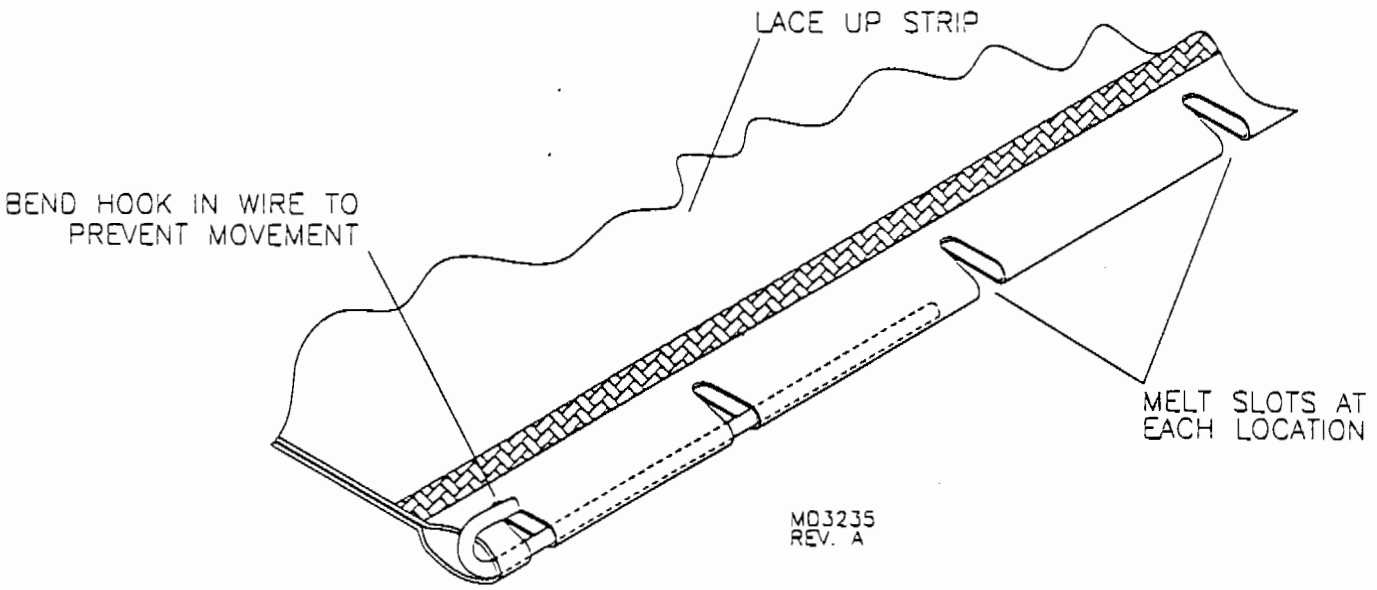
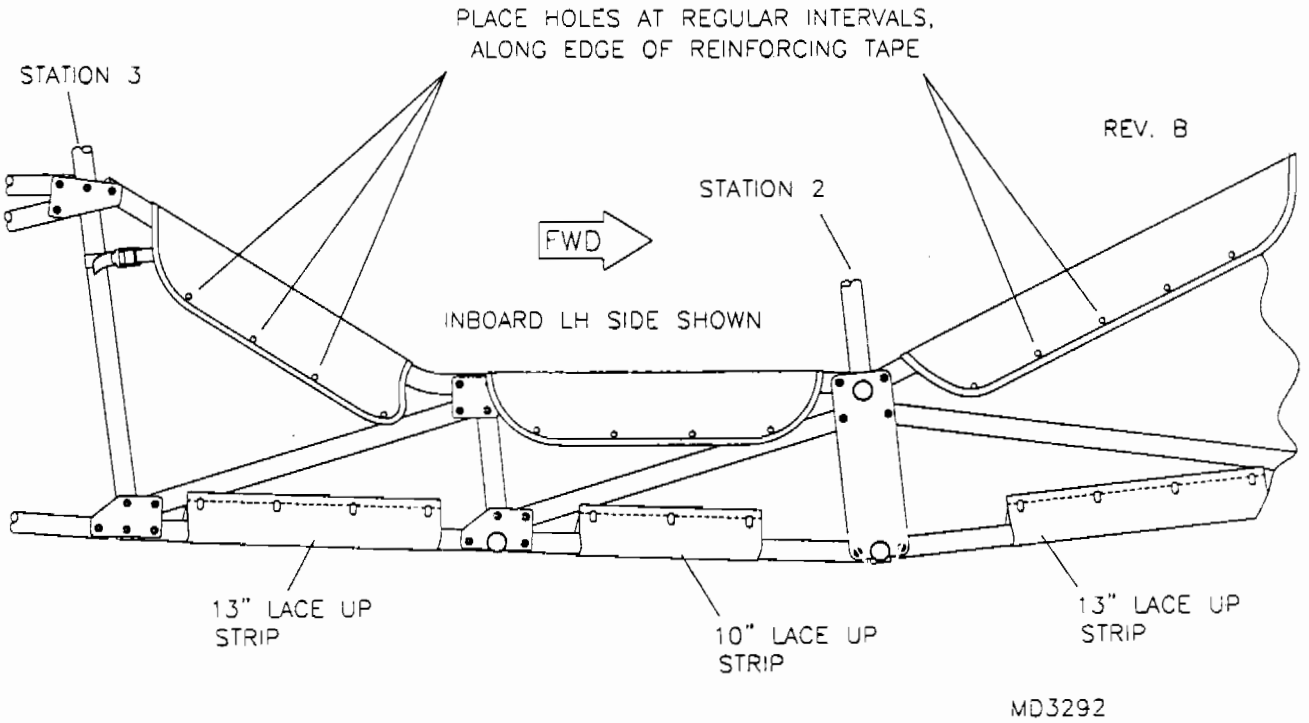


FIGURE 014-05B



6. Using a soldering iron or hot knife, penetrate the skin's overlapping flaps at regular intervals, immediately above the white reinforcing tape, per **FIGURE 014-05B**. Cut six feet of seat rope, knot an end and loosely lace together the LH forward cockpit side and lace-up strip, per **FIGURE 014-06**. If viewed from the end of the rope, it would form the circular pattern shown in **FIGURE 014-06A**.

FIGURE 014-06

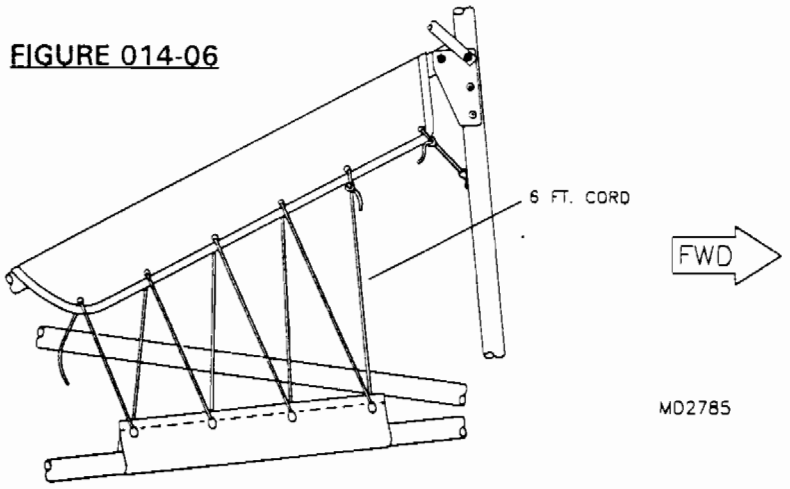
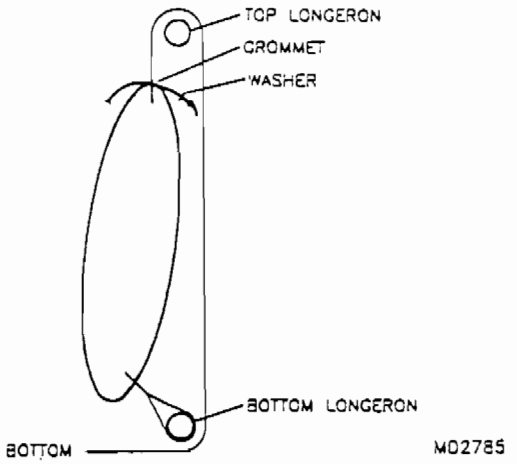


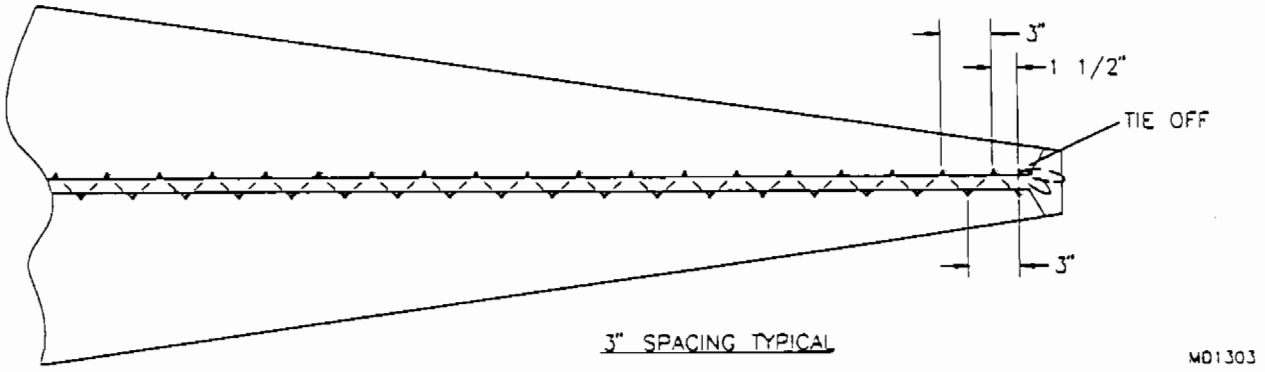
FIGURE 014-06A

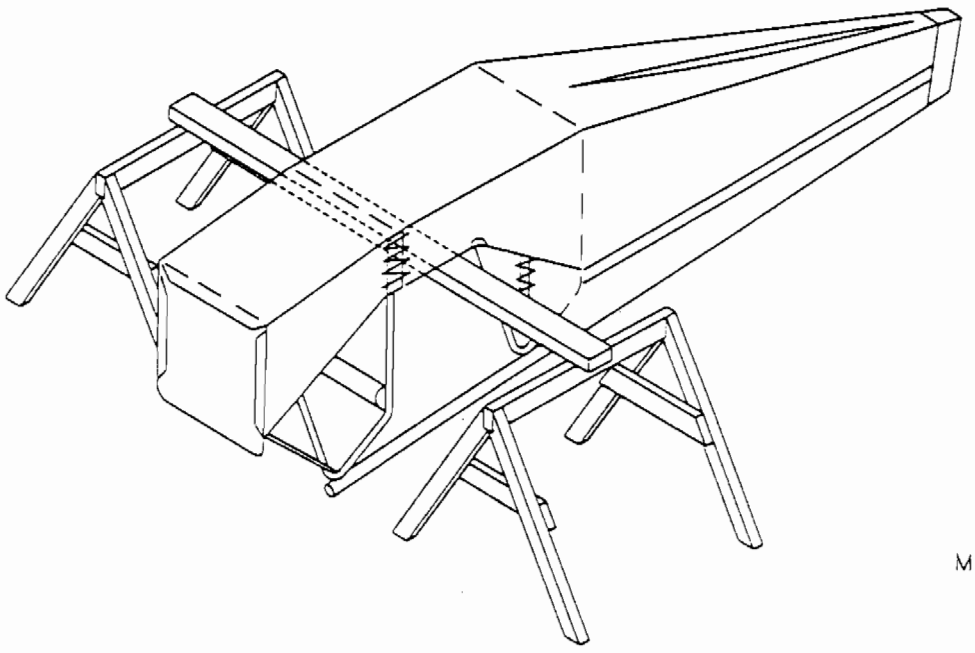


Locate holes along belly seam per **FIGURE 014-6B.** This is most easily done by inverting the fuselage and placing it atop saw horses.

FIGURE 014-6B

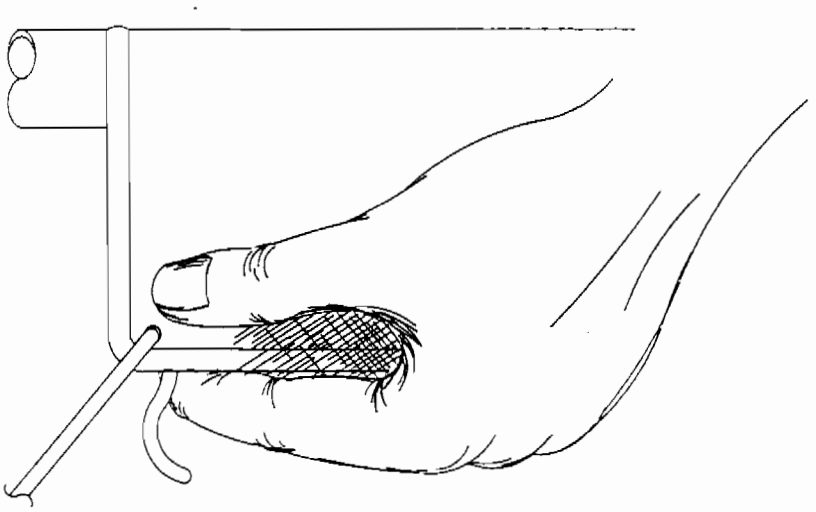
BELLY SPACING AND LACING





It is not necessary to lace through all holes until the skin is in the exact position. Lace loosely; tighten in the sequence given. To tie off without losing tension, pinch the rope at the hole and tie off using two half-hitches. See **FIGURE 014-06C.**

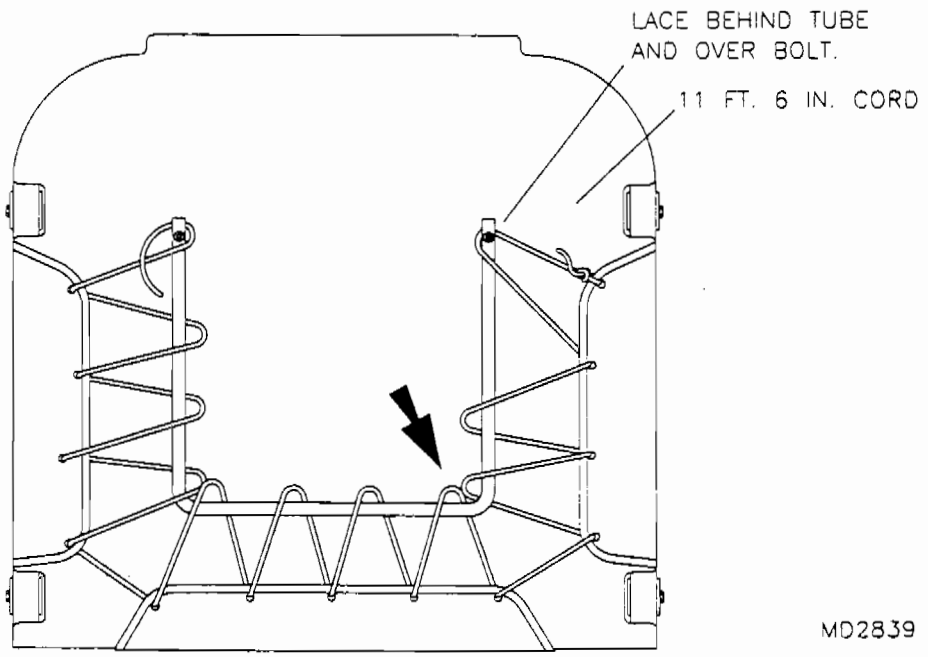
FIGURE 014-06C



MD2839

7. Space holes evenly along edge of reinforcing tape of front flaps, pull the bottom front flap forward as far as possible and start lacing to the firewall from the top LH corner; see **FIGURE 014-07.** At first, the rope won't reach the last few holes until the skin is closer to its final position. Typically three to four rows of belly holes may need to be completely unlaced to get the bottom flap in position.

FIGURE 014-07



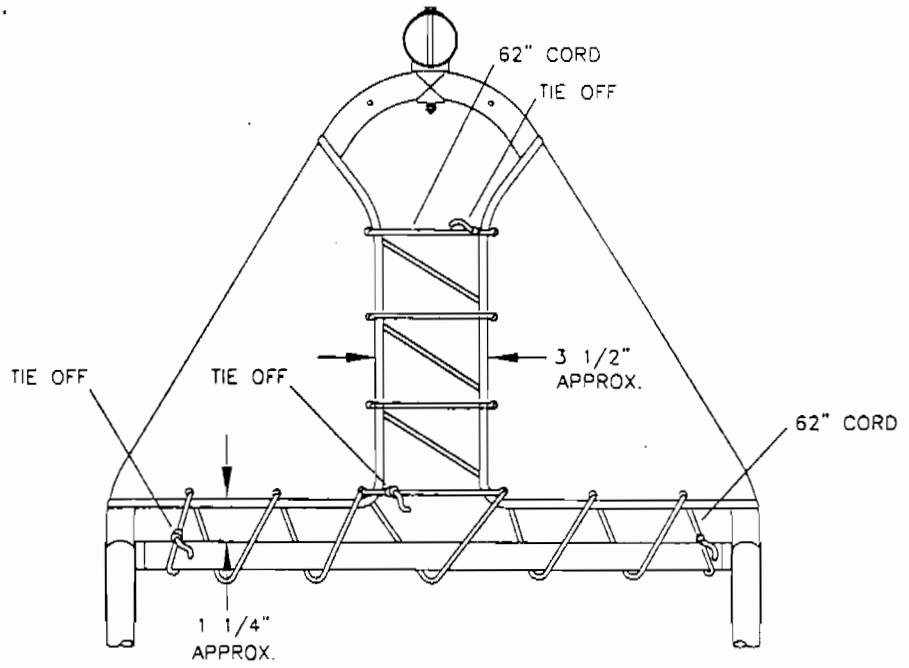
MD2839

NOTE: If covering a trike-equipped fuselage, an opening must be cut for the nose wheel swivel bushing.

The bottom flap will need to come far enough forward so the zig-zag stitching is on the firewall. **CAUTION:** It is easy to pull the side flaps too far, resulting in uneven overlaps. To prevent this, pull the cord at the location indicated by the arrow. This will pull the bottom without distorting the side flaps. If the skin is properly located, the seam positions will match along the bottom of the forward cockpit bottom longerons. Pull gently and don't tug at the cords or holes; the skin may tear.

8. Lace the S-3 vertical followed by the S-3 horizontal, as shown in **FIGURE 014-08**. **HINT**: Lace to horizontal cord first.

FIGURE 014-08



Make sure the cinch straps at the tail are undone and the belly lacing is loose, then gently close the gaps to the approximate measurements. The idea is to pull the skin into its proper position over the tailcone. This will help locate the forward section of skin, too.

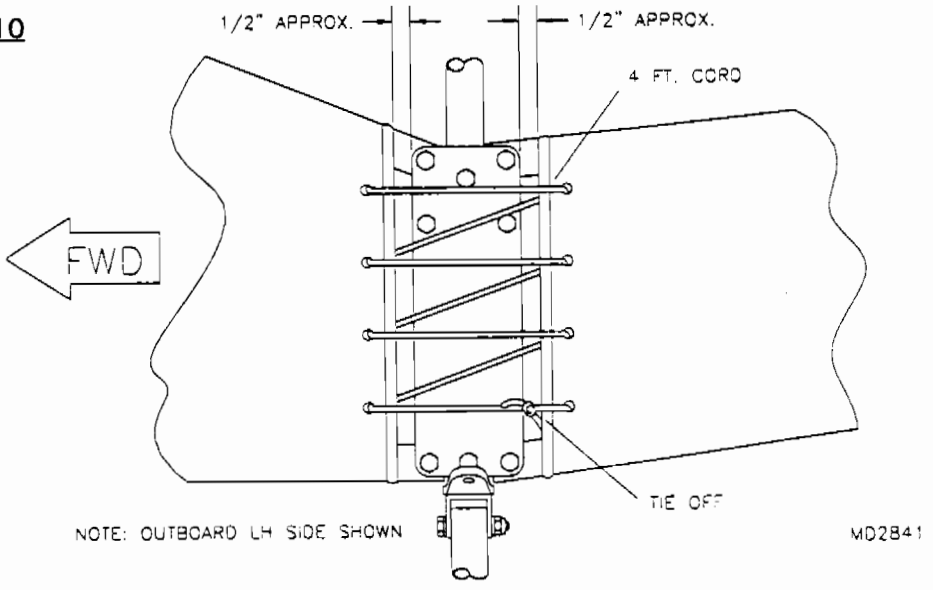
Check for stripe alignment. At this point, it is very easy to pull the skin to one side by over-pulling the horizontal lacing.

As always, be careful not to over-stress and tear the skin. The skin and reinforcing tape can take quite a load, more than enough to adequately retain a tight skin; however, this load should be induced evenly to all holes.

9. Loosely lace up the right forward cockpit flap in the same pattern as for the left. Refer back to **FIGURE 014-07**.

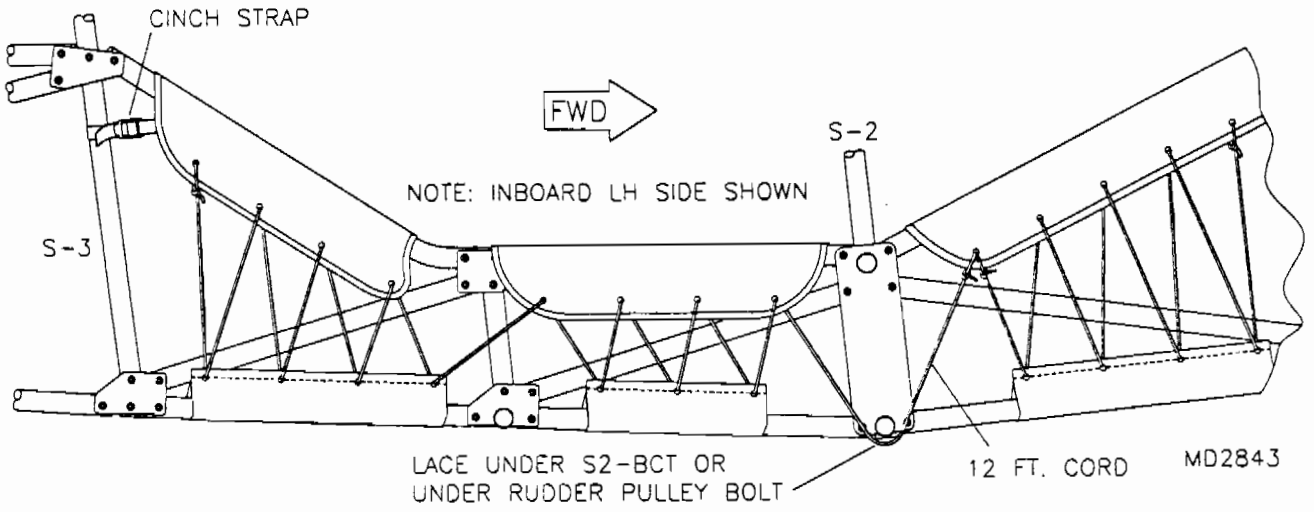
10. Lace the side spaces between the forward and aft cockpit sides as shown in **FIGURE 014-010**. This lacing will pull the bottom and side into position. The gaps should be approximately the size shown.

FIGURE 014-010



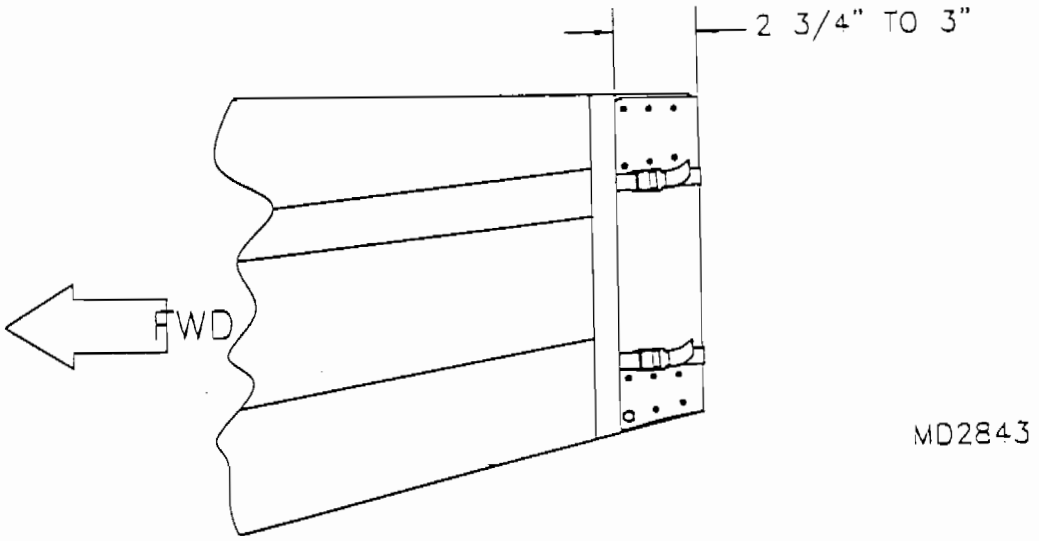
11. Penetrate and lace the aft cockpit sides as shown in **FIGURE 014-11**. Continue the rope forward under the S-2 bottom crossing tube and tie off at the rear hole on the forward cockpit side flap. **NOTE:** This may not be possible until the skin has moved to its forward position. Tension both sides evenly, but not excessively; too much tension can induce wrinkles. Wrap the cinch strap around the S-3 vertical tube and pull tight. This, combined with the rope tied off to the forward flap, should pull out any fore/aft wrinkles. See **FIGURE 014-11**.

FIGURE 014-11



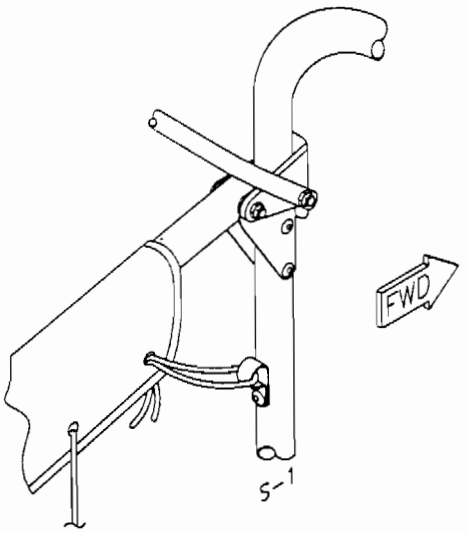
12. Lace and pull tight the tailcone cinch straps. The skin should fit as shown in **FIGURE 014-12.**

FIGURE 014-12



13. Tie off the forward cockpit flaps to the firewall with two segments of rope in the manner shown in **FIGURE 014-13**. This will pull out any wrinkles on the top side. **HINT:** Some aft and forward cockpit side panel wrinkles can be eliminated by pre-tensioning with the lacing between the two sections and the aft cockpit cinch strap. Tension **before** pulling tight the lacing between the flaps and lace up strips.

FIGURE 014-13

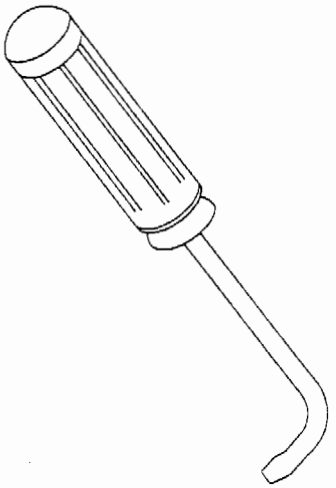


MD2843

14. Pull the belly lacing tight. As the belly is tightened, the skin should now be generally in position. Re-check your work and fine-tune the fit by re-tightening where needed. Pull from front to back by hooking the exposed cord and firmly pulling out.

15. **Hint:** Fabricate a pulling tool from an old screwdriver; heat and bend the end into a hook. See **FIGURE 014-15**. Several passes may be needed. Some wrinkles will remain in the bottom, but the upper surfaces will smooth out and become drum tight. Stop at this point and tie off the cord. Hot-knife the excess, leaving at least six inches for future access and tuck this into the fuselage.

FIGURE 014-15



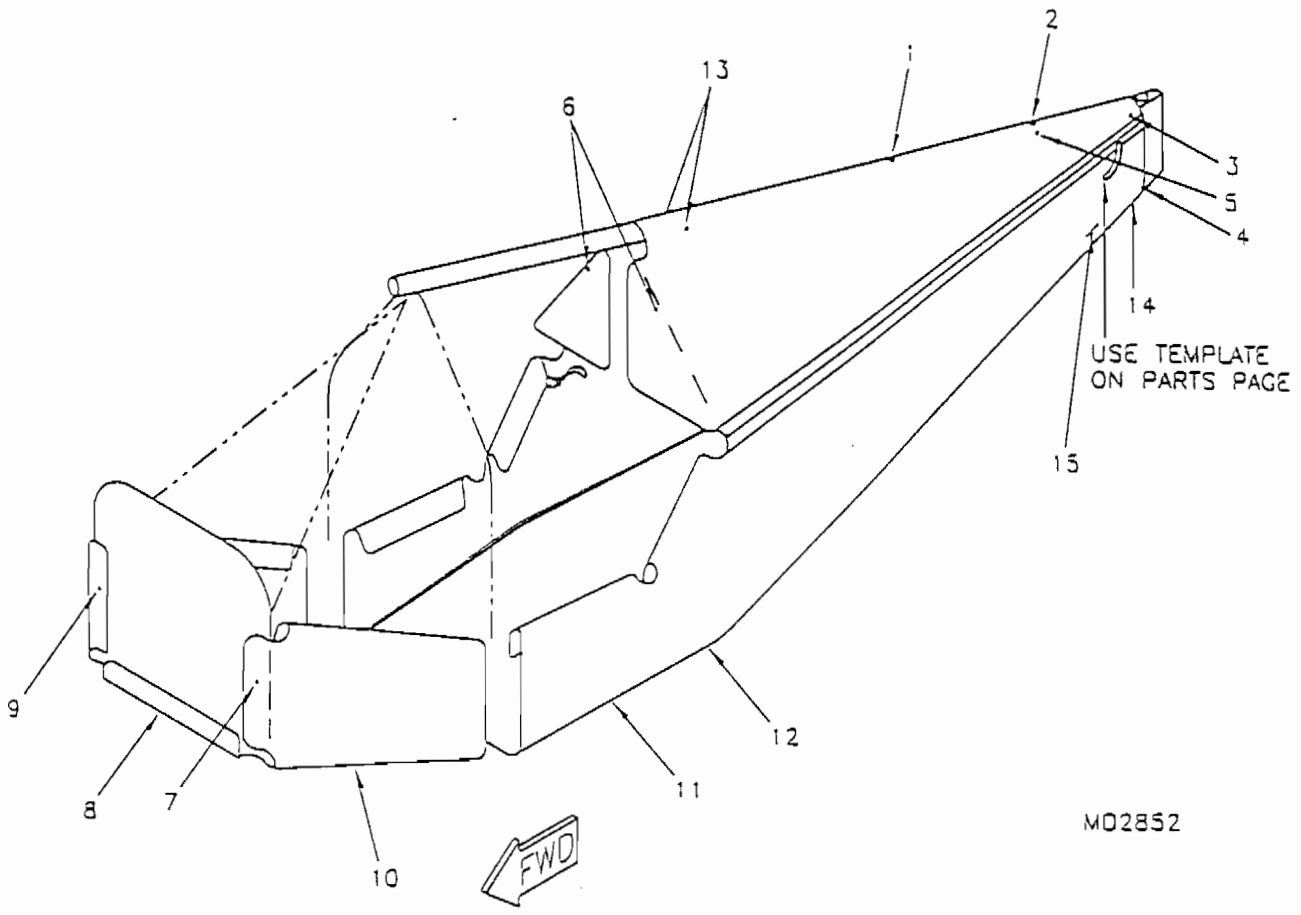
MD3743

16. Turn the fuselage right side up. Trim off excess length of cinch straps and ropes, leaving about two to three inches of line from the knot so future re-tieing will be possible. **DO NOT** trim off too close to the knot or you will need new rope if you ever re-lace the skin.

17. Melt through the holes illustrated in **FIGURE 014-17** with a pointed soldering iron; locate the holes by feeling for depressions through the fabric. Push the hot soldering tip into the center of the hole and work out. Cut around the S-4 bolt head by allowing the tip to track against the bolt's washer; this will make a very clean hole.

Before installing the 2" saddles and trailing edge spar attach brackets to the keel, grind away the lower cusp of each saddle to provide a neat fit against the fuselage skin.

FIGURE 014-17



Key to Figure 014-17

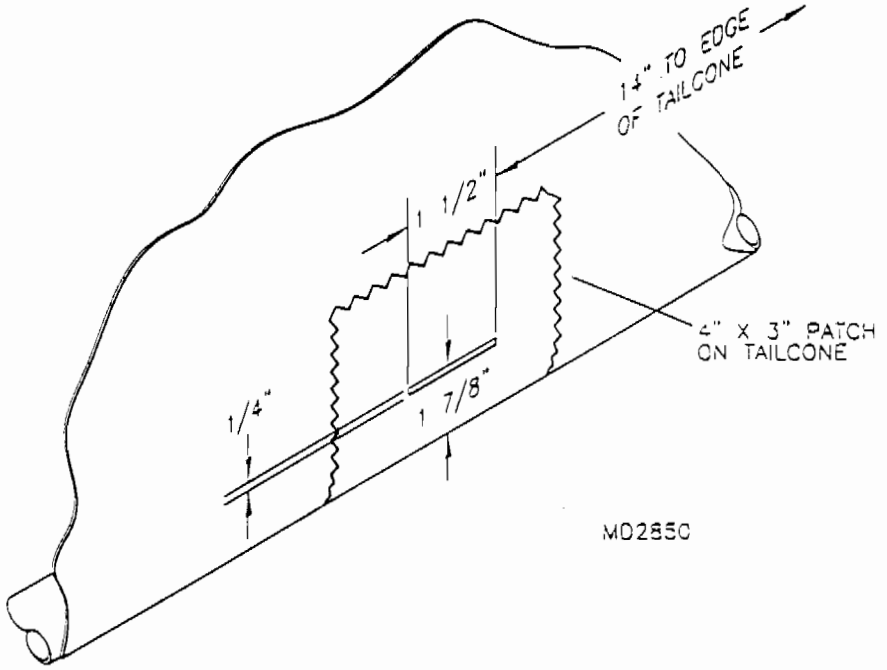
1. S-4 Bolt
2. Vertical Fin Bolt Hole
3. Stabilizer Aft Bolt Hole
4. Tail Cable Tang Hole
5. Stabilizer Forward Bolt Hole
6. Door Brace, Door Option Only
7. Cowling Retainer
8. Nose Gear Strut Exit
9. Cowling Retainer
10. Steering Slots Nose Gear
11. Gear Brace
12. Gear Brace, Trikes Only
13. Trailing Edge Spar Attach Bracket
14. Tailwheel, Taildragger Only
15. Rudder Cable Exit

IRONING OUT WRINKLES: A LAST RESORT

18. **IRONING:** A clothes iron can be used to pull out minor loose spots or wrinkles. Do so on a medium setting and don't stop or you will melt the skin. Don't iron against the tubes.....iron **between** the tubes. Apply the iron directly over the loose zones. Use ironing as a last resort. Re-check positioning and lace-up tension before ironing. **NOTE:** Be sure to iron the bottom first if ironing is needed.

19. Cut out the elevator yoke exit template (see the parts page) with a utility knife or similar tool. These holes will serve as a template, so cut accurately!!! Cut out the bracket notch line-up marks to hold the template on the tailcone. See **FIGURE 014-19** for the rudder cable cut out.

FIGURE 014-19



20. After positioning the template on either side, take a marker (flair, taylor pen, pencil, etc.) and carefully draw the perimeters of the holes; repeat for the opposite side.

21. Hot-knife the openings marked off with the template. The fuselage covering is now complete. Inspect your work, checking for secure knots and tight cinch straps. Beautiful, isn't it?

S-4 & S-5 VERTICAL STABILIZER

"How To Skin The Tail Of A Coyote"

The tail skins are sewn to fit drum tight and require special care, methods and tools (See "Coyote Tail Skinning Tools" at the end of this section). These drawings illustrate the tools we use at the factory. It is possible to build your own from the drawings or call our parts department and receive our "loaner" set. The main idea behind the tools is to gain leverage so that the struggle of pulling in the skin is eliminated. Assembly without the tools can be done using sturdy scraps of lumber, rope and jerry rigging a set up. Most importantly, don't leave out the internal braces. The stabilizers will be the easy part. The elevators and rudder require more skill. Above all, clean then clean again your hands, tools and the work area so when you finish your new plane still looks it.

Tail Group and Elevator Push Tube Assembly

1. Refer to the parts drawings and pre-assemble the TC-1's tp their respective tubes. See **FIGURE 015-01** and **FIGURE 015-01A** for additional details. **NOTE:** Three of the stainless steel hinges will need to be drilled out to ¼". Insert and rivet the end caps on the correct tubes. See the parts drawing.

FIGURE 015-01

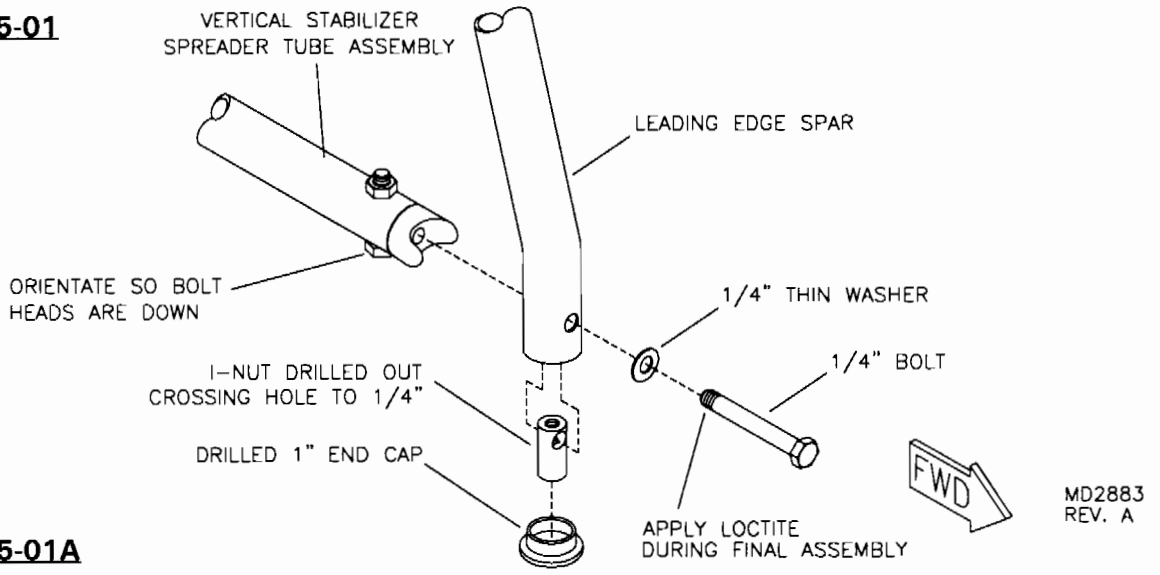
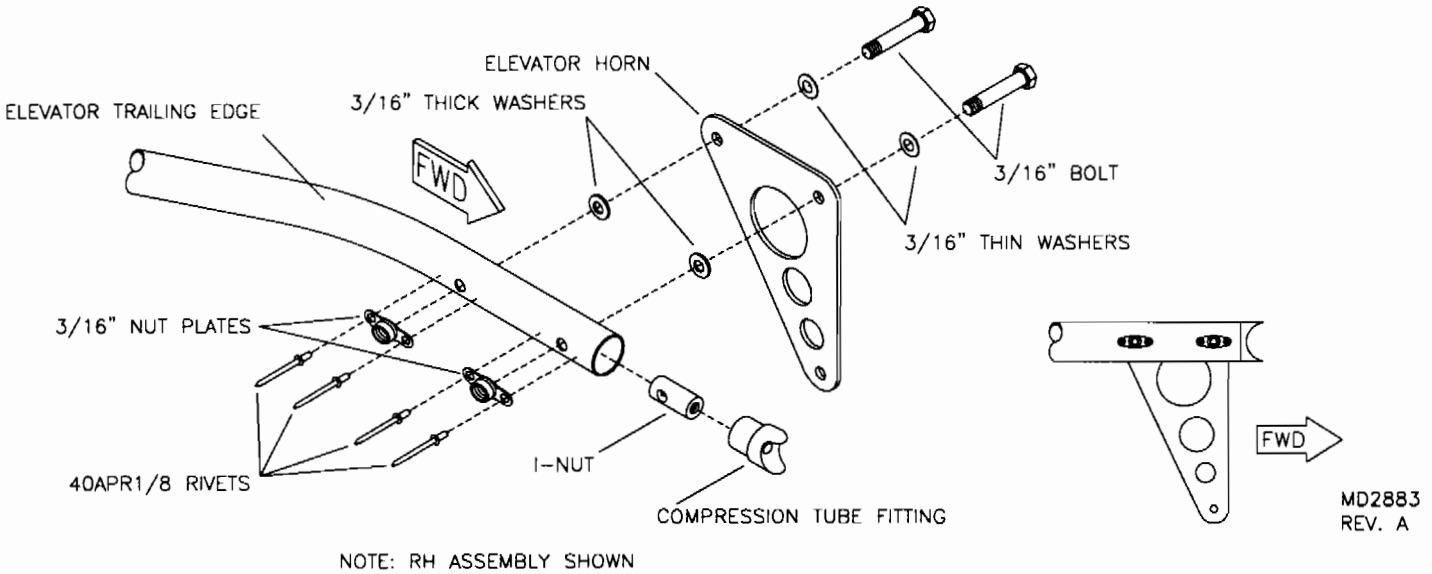


FIGURE 015-01A

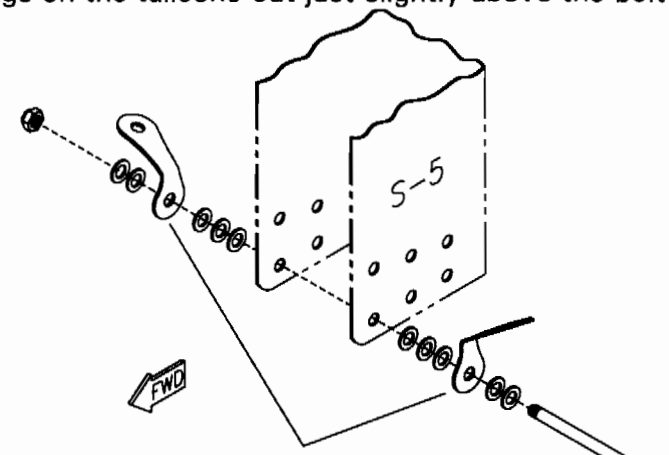


NOTE: RH ASSEMBLY SHOWN

2. Install the nut plates on the horizontal and vertical stabilizers and both the leading and trailing edge tubes as per the parts drawing.

3. Bend the hummertangs on the tailcone out just slightly above the bolt head. See **Figure 15-03**.

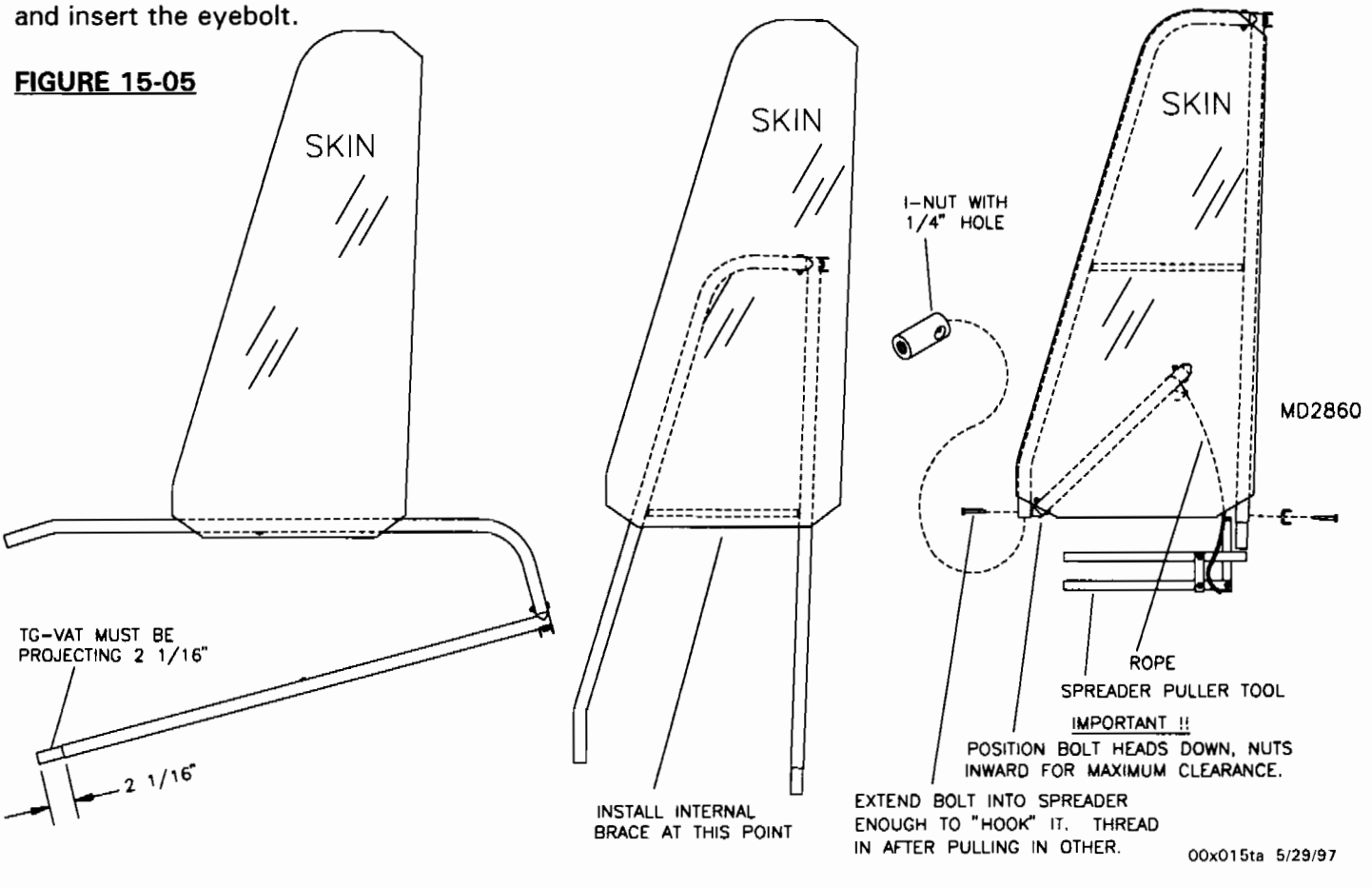
FIGURE 15-03



4. To completely assemble the vertical fin consult the parts drawing. **NOTE:** The vertical fin leading edge spar should be pre-assembled prior to this point. Fasten the vertical stabilizer spar to the top of the leading edge tube with the hinge bolt assembly. Loctite the bolt and insert until snug and 90 degrees to the spar. Be careful not to over tighten the bolt and squash the tube.

5. Take the vertical stabilizer skin and slip it over the partially assembled frame work as shown in **Figure 15-05**. Slip the I-Nut (drilled 1/4") over the 1/4" bolt centering the I-Nut inside the vertical stabilizer's tube. Install the internal brace tube before pulling the skin all the way down. Be sure the frame is through the opening at the top and not hooked on the eyebolt before pulling tension. Use loctite on the bolts. Use a small segment of rope to pull the spreader in close enough to hook the tool. Rest the tool on the ends of the tubes to pull against the skin. Pull tube in line with the hole and insert the eyebolt.

FIGURE 15-05



6. Select the appropriate parts for both horizontal stabilizers and assemble. To skin the horizontal stabilizers repeat the procedure for the vertical fin.

7. Select the parts needed to complete the rudder and elevator assembly. Drill #11 through the spar at the hinge hole. On the "button" side, rivet on the nut plate. Refer to **Figure 15-07** and **15-07A** for the details on skinning these frames.

FIGURE 15-07

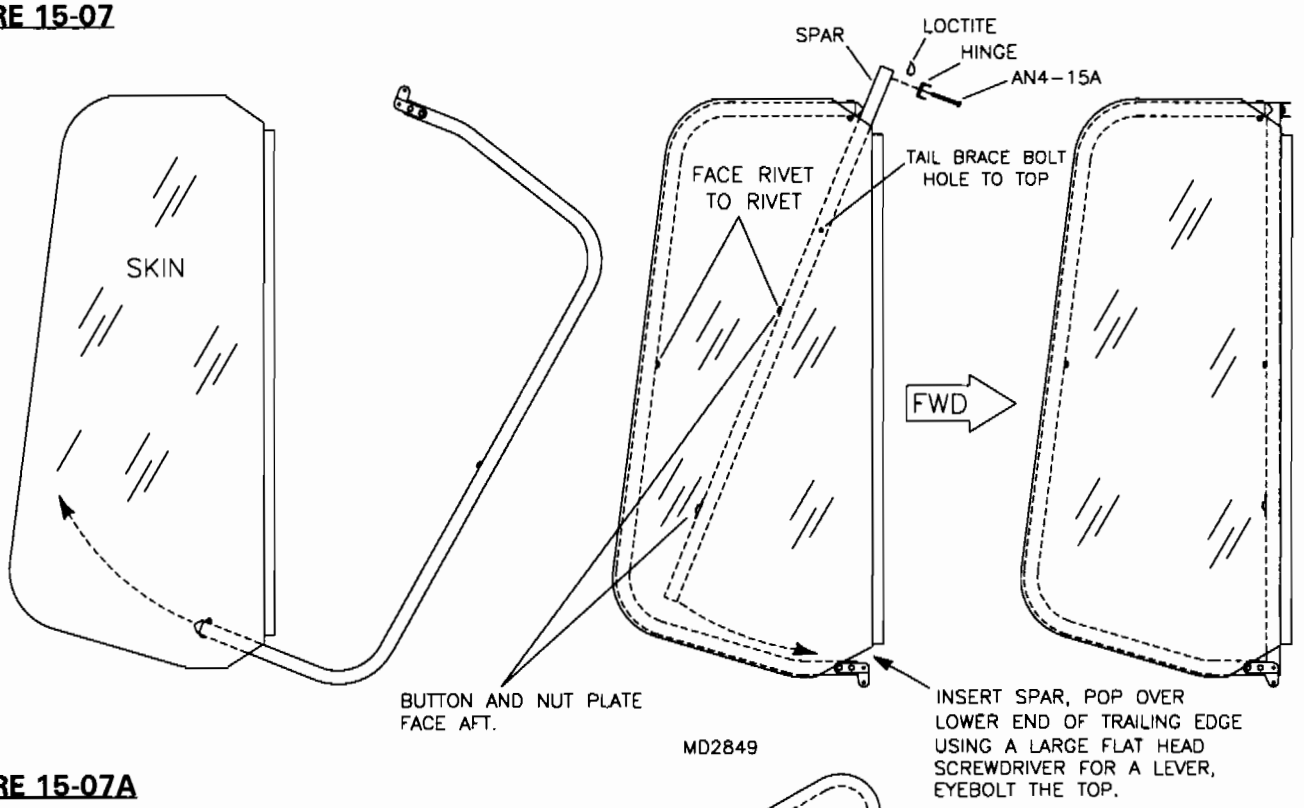
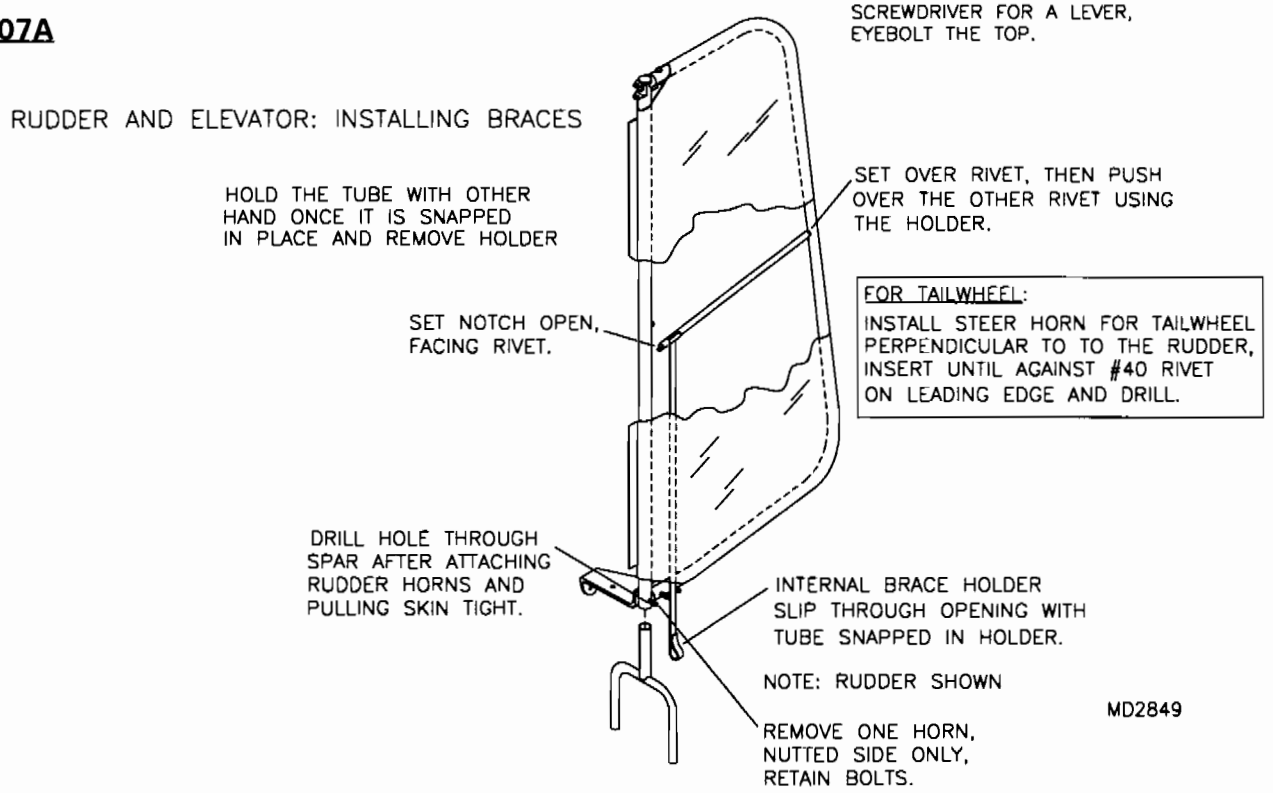


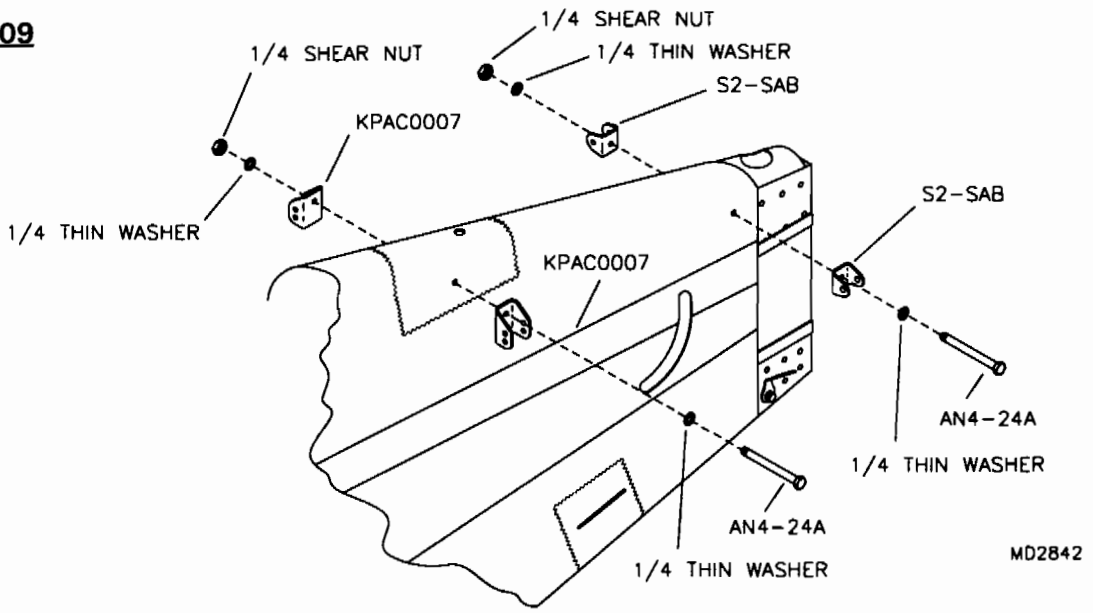
FIGURE 15-07A



8. Using a pointed tip of a soldering iron, melt the holes through the fabric at the tail brace tab locations on the stabilizer spars.

9. See **Figure 15-09** to select the parts needed to install the brackets to the tailcone. Drill out the brackets to 1/4" and debur. Align the brackets so they are parallel to the keel. Torque lightly.

FIGURE 15-09



10. File the keel to have a 3/8" diameter notch to within 3/16" of the edge of the 7/8" hole for the vertical fin spar. See **Figure 15-10**. Insert the vertical fin spar into the 7/8" hole on the top of the keel. Be sure the fin is all the way into the hole and plugged into the bottom of the keel. File a small radius on the plastic end cap before bolting so it contours the keel. Loctite the AN4-23A bolt and insert it and the washer into the belly up through the forward fin attach hole. **HINT**: Use an extension of at least 18". Fasten down the fin's leading edge with moderate torque. Transfer drill through the S-5 and vertical stabilizer spar doubler with a #11. Bolt as per the parts drawing. See **Figure 15-10A**.

FIGURE 15-10

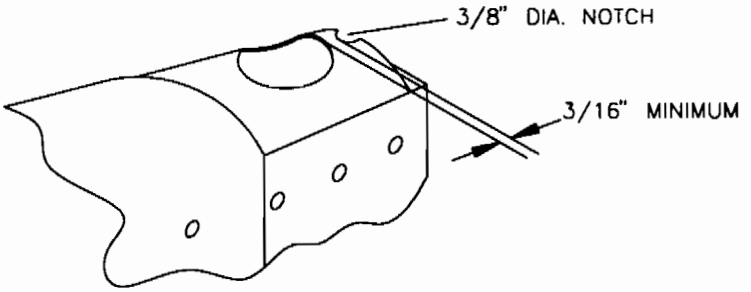
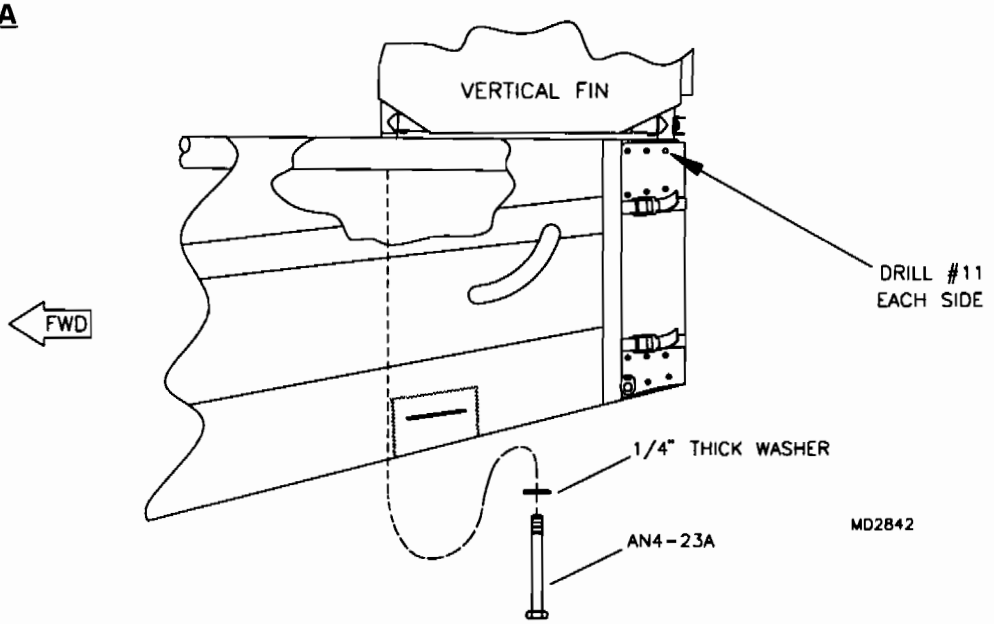
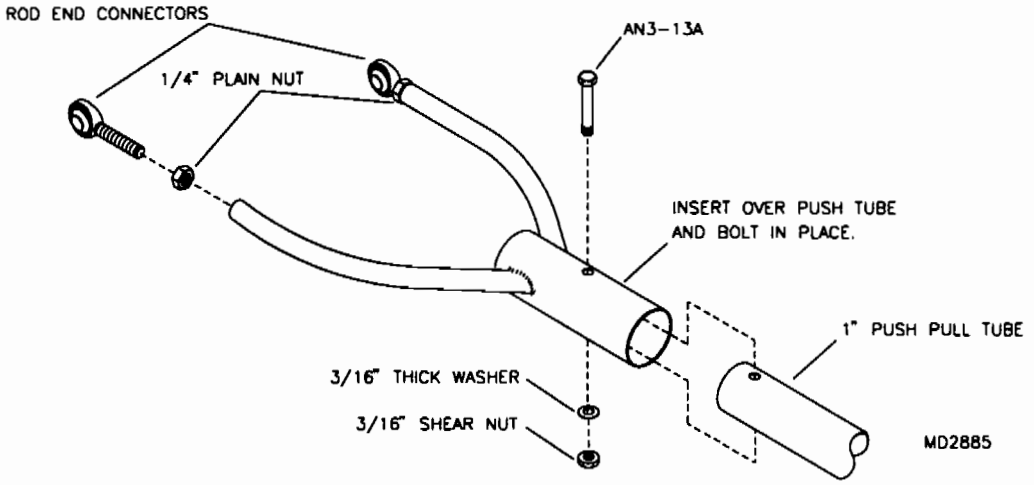


FIGURE 15-10A



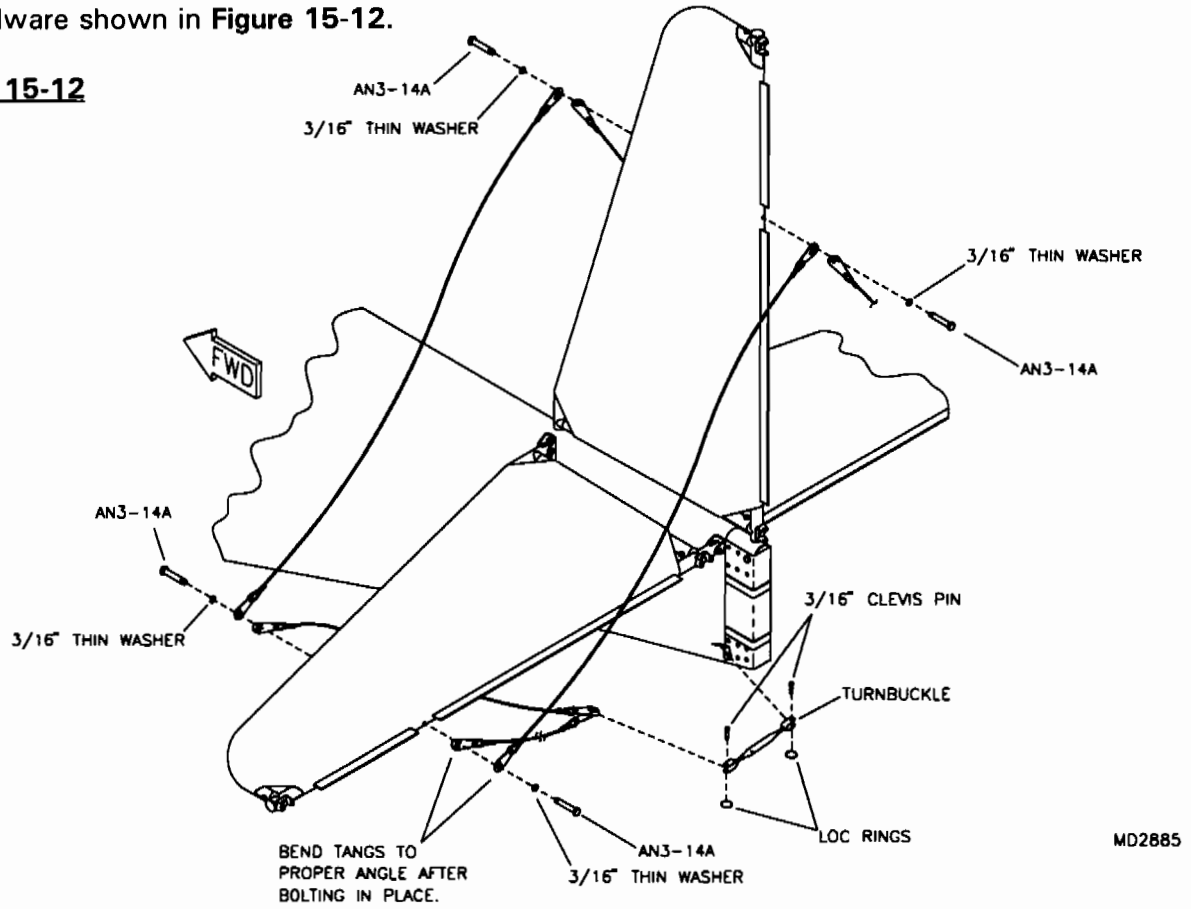
11. Assemble the elevator's 1" push pull tube using the parts shown in **Figure 15-11**. After assembly, install into the tailcone by slipping through the lower half of the S-3. Bolt to the control stick swivel joint.

FIGURE 15-11



12. Once the vertical fin has been installed, the upper and lower bracing cables can be bolted using the hardware shown in **Figure 15-12.**

FIGURE 15-12

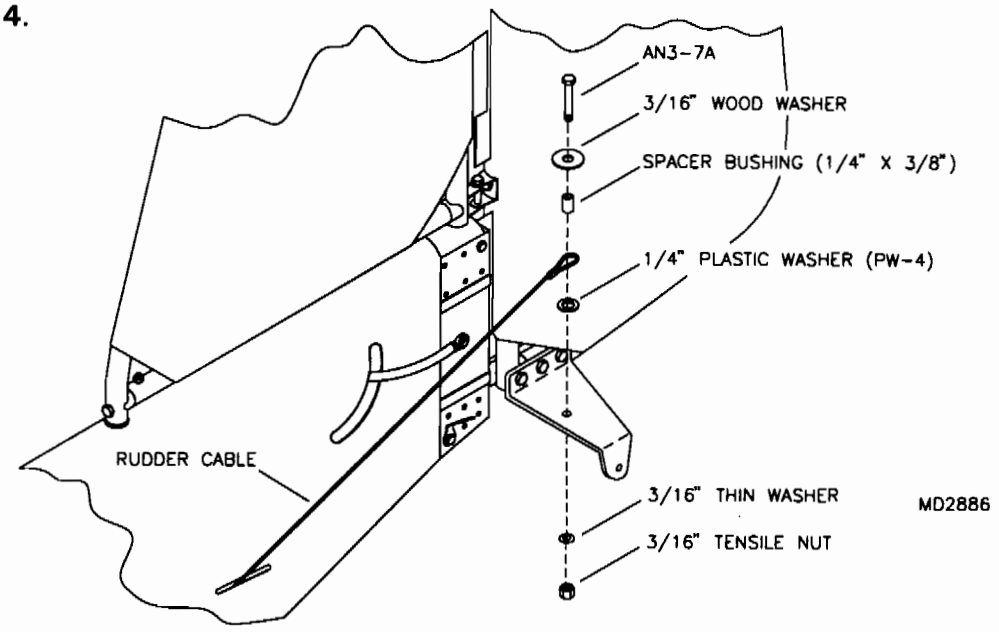


13. To adjust the tail, view the aircraft from head on with the wings attached. Tighten or loosen the lower cable turnbuckles as required to bring the tail level with the wings. Moderate tension should be even on all cables. Too much tension will cause the skins to wrinkle on the stabilizers. Strum the wires to check for even tension on all wires. Each should sound close in pitch. **NOTE:** The forward wires of both the top and bottom sets may be a little less taut. This is perfectly okay, just so they don't hang slack.

If for some reason all the wires do not "even out" in tension, try another hole in the end of the cable tang. Safety wire the turnbuckles once the tail is properly set. **NOTE:** Drill out the elevator horns to 1/4" and bolt with an AN4-7 bolt.

14. Fish out the rudder cables through their respective slots. **CAUTION**: Be sure the left cable exits the tailcone on the left and the right cable likewise. Bolt the cables to the rudder horns as shown in **Figure 15-14.**

FIGURE 15-14

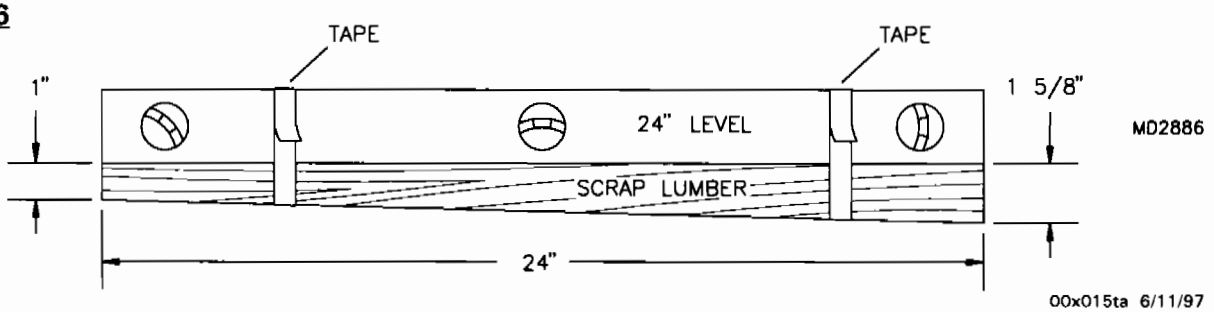


15. Select the hardware to bolt on the elevators and rudder to the stabilizers. **NOTE:** The rudder hinges ride on top of the stabilizer hinges.

Rigging and Adjusting The Tail

16. The horizontal stabilizer may need to be adjusted in incidence. Incidence is the angle difference between the wing and tail. In most cases, the tail plane is set at an angle **NEGATIVE** to the wing. This allows the tail plane to exert a down load to react against the lift from the wings. As weight in the nose is increased or reduced, adjustments to the incidence angle may be required. On the Coyote I, a setting of one degree is a good starting point. We recommend assembling the plane and checking the tail incidence against the wings after final assembly. If you do not have an accurate protractor, use a two foot carpenters level to measure the incidence angle. First cut a scrap of lumber into a wedge 24" long and 5/8" thick on one end and to a point at the opposite end. For your information, one degree slopes around 5/16" per foot. Tape this wedge along the length of the carpenters level. See **Figure 15-16.** Raise the tail of the plane until the **BOTTOM** of the wing is level. Check this by placing the level on the keel inside the cabin. Next take the level and place it on the **TOP** of the horizontal tail with the 1 5/8" end to the **FRONT**. If your tail plane does not read level, lift one end to decide which way the adjustment needs to be made. In most cases, the leading edge of the horizontal stabilizer will need to be **LOWERED**. The horizontal stabilizer's forward attach brackets are provided with several adjustment holes. These are used to fine tune the incidence angle. **NOTE:** It will be required to adjust the tail cables when making incidence changes.

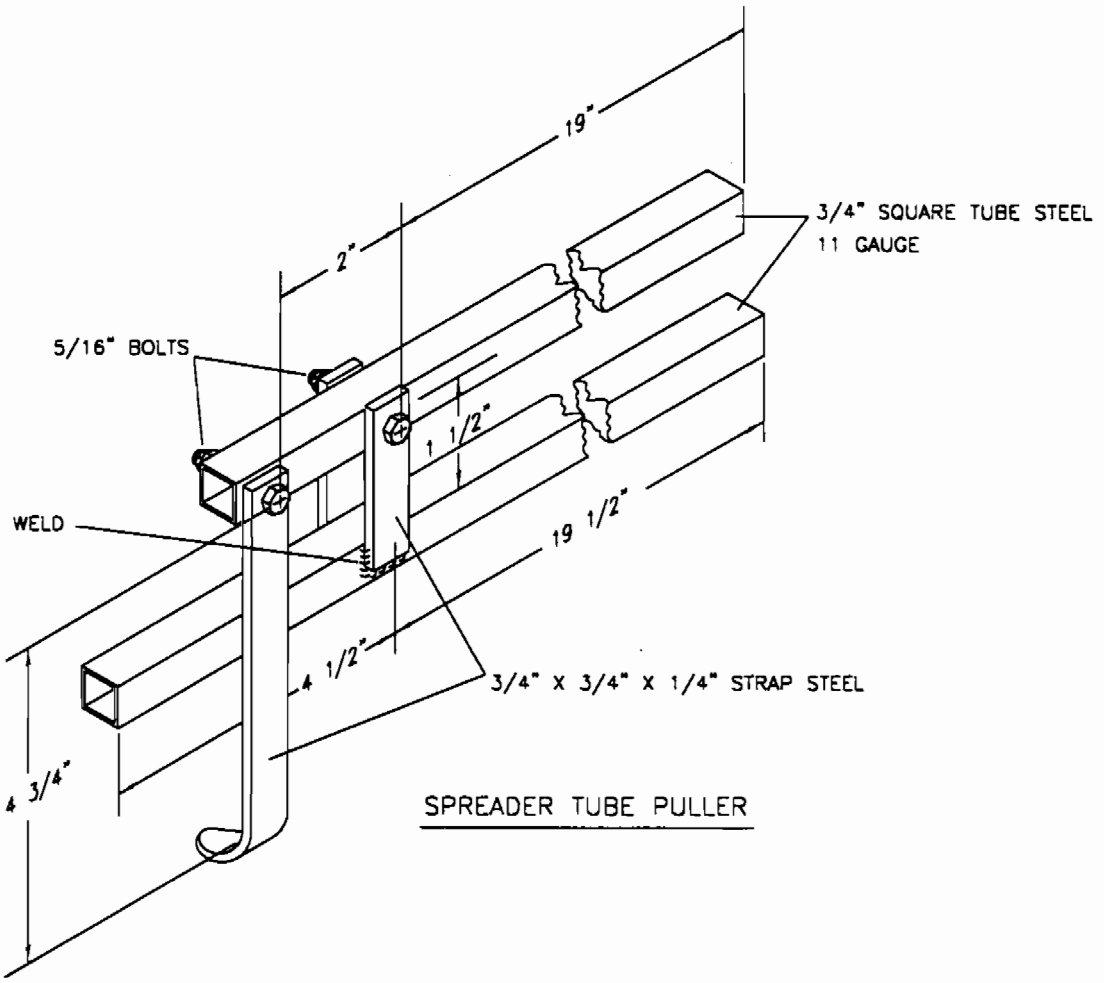
FIGURE 15-16



Flight Testing Incidence

17. Flight testing should show the Coyote I to fly level with no trim between 70 mph to 80 mph. If your ship is not flying with positive dive recovery between these speeds, increase the negative incidence of the horizontal stabilizer. Positive dive recovery is **critical** to safe flying. It will give you a way to control the aircraft in pitch should the elevator become disconnected. A properly trimmed plane will rise and descend with varied application of power. This makes controlled flight and landings possible without using the elevator. This is the theory. The actual chance to practice this we hope never comes. **Always** check all elevator connections during pre-flight.

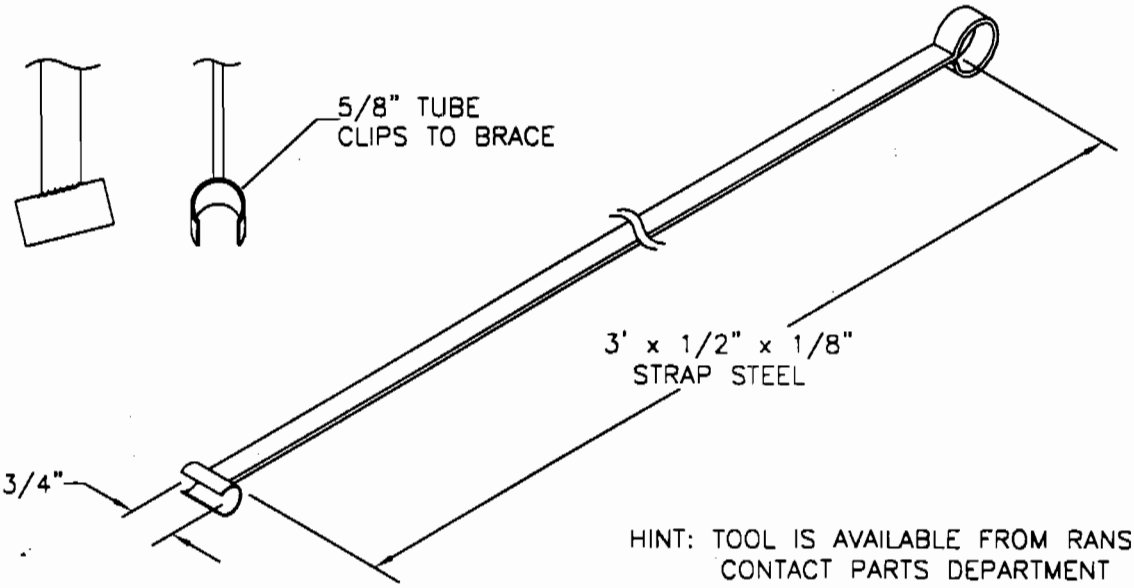
"Coyote Tail Skinning Tools"



SPREADER TUBE PULLER

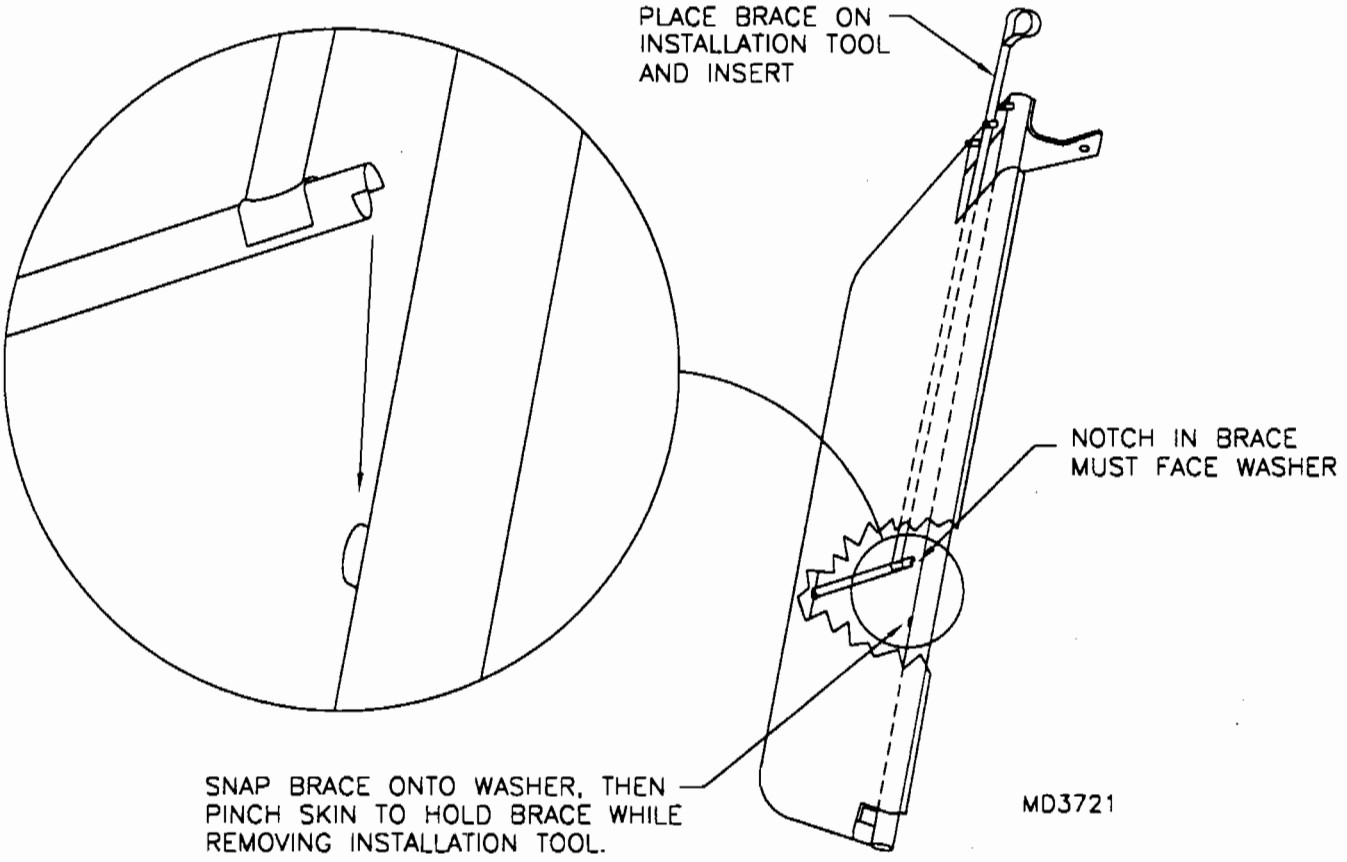
MD2851

RANS INSTALLATION TOOL



HINT: TOOL IS AVAILABLE FROM RANS;
CONTACT PARTS DEPARTMENT

CLIP IS FABRICATED FROM
A 5/8" X .058 TUBE WELDED
TO STRAP AT APPROX. 20° ANGLE



S-4/S-5 ELEVATOR TRIM SYSTEM

***NOTE:** Trim system cable/housing should be zip-tied within fuselage prior to covering.*

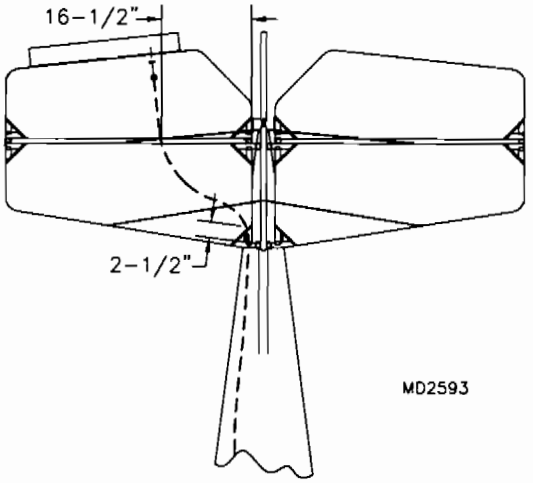
1. Cut trim cable housing to approximate length, leaving generous margin for error. Straighten about three feet of cable and bevel one end smooth. Pull housing straight and carefully feed cable into housing; leave plenty of cable extending beyond both ends of housing. *If housing is not straight while inserting cable, cable's leading end may damage housing's nylon lining, jamming system.*

2. Install cable/housing to fuselage; secure with zip ties to avoid interference with rudder and elevator controls. *Avoid sharp bends that may bind cable.*

3. Once fuselage is covered, make a small hole in skin, immediately below right stabilizer, just aft of leading edge. A fine-tip hot knife will neatly "melt" hole, preventing Dacron threads from fraying; *hole should be no larger than necessary to accommodate cable housing*. Before skin is laced along bottom centerline, reach into fuselage and feed one or two feet of cable/housing out hole. Retract forward end of cable enough to allow trimming forward end of housing; carefully file ends of housing as necessary to remove burrs that may cause wear and eventual failure. Install forward end of housing to cable housing retainer on throttle quadrant, per parts drawing.

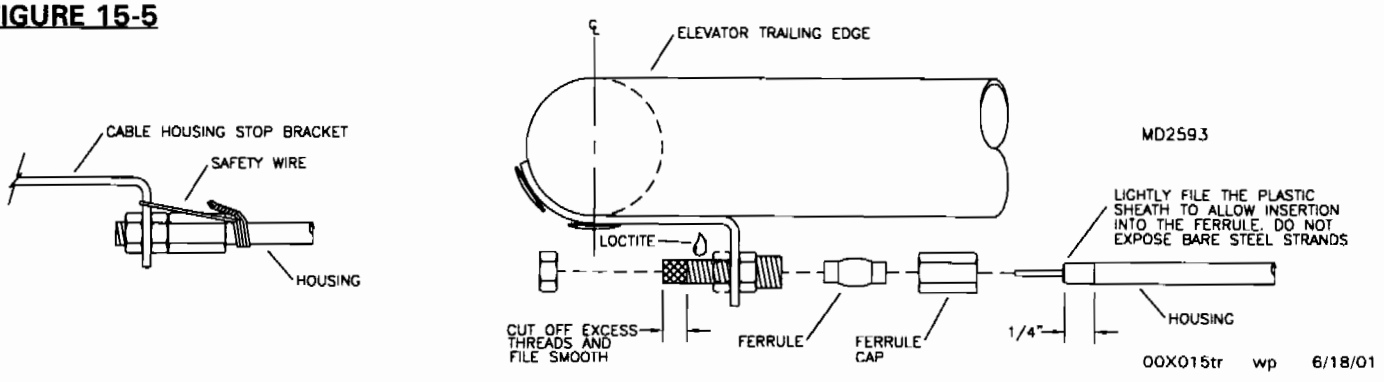
4. Drill undersides of right horizontal stabilizer spreader tube and elevator spar to accommodate 3/16" rivet nuts; locate so cable/housing may exit fuselage and pass through tube clamps without significant bending, per **Fig. 15A-4**. Assemble tube clamps to spreader tube and spar, per parts drawing. Locate, drill and rivet cable housing stop bracket to underside of elevator trailing edge spar, per parts drawing. ***NOTE:** clamp and bracket must align at right angle to elevator trailing edge, per **Fig. 15-4.*** Assemble conduit adjustor assembly to stop bracket; trim excess threads, leaving approximately 1/4" of threads exposed beyond nut. Apply Loc-tite during assembly.

FIGURE 15-4



5. Trim housing to final length. Install cable/housing to clamps, through ferrule cap and ferrule of conduit adjuster; tighten. Safety-wire housing to assembly. See **Figure 15-5.**

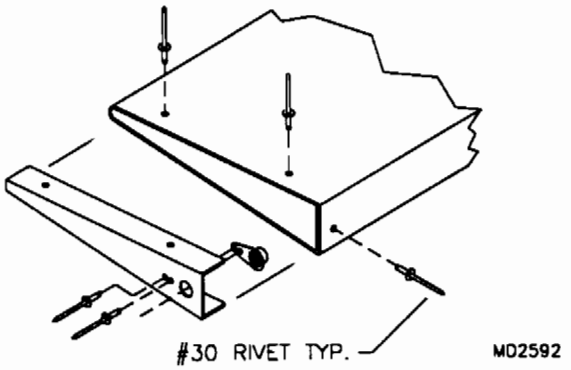
FIGURE 15-5



6. Install forward end of cable to wire swivel/screw stop on trim lever, per parts drawing.

7. Assemble trim tab, per **Fig. 15-7.** Be certain tab is not twisted when drilling and riveting.

FIGURE 15-7



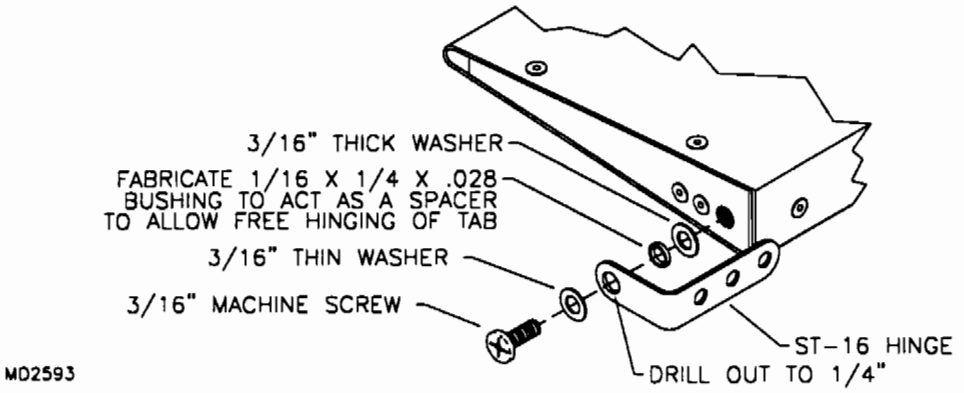
STEP 1: CLECO LEADING EDGE OF TAB WITH #40 CLECOS. PLACE ON FLAT SURFACE AND CHECK FOR STRAIGHTNESS, DRILL TO #30 (LEADING EDGE ONLY). RIVET WITH AAPQ-41 RIVETS. (BE SURE BOTH LAYERS OF METAL ARE DRAWN TOGETHER PRIOR TO RIVETING).

STEP 2: DRILL AND RIVET NUT PLATE TO EACH END RIB.

STEP 3: INSERT NUT PLATED END INTO TAB AND RIVET.

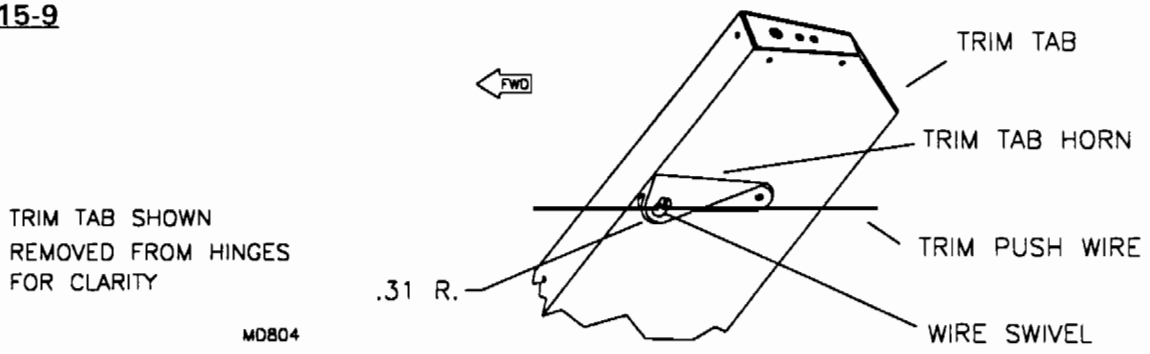
8. Attach hinges to tab, per **Fig. 15-8.** Center tab on elevator trailing edge, locate innermost holes of tab hinges on centerline of trailing edge and drill #11. Remove hinges from tab and rivet to elevator; drill remaining holes and rivet. Install tab to elevator. Refer to parts drawing.

FIGURE 15-8



9. Drill hole for tab horn swivel to 1/4". Test fit wire swivel/screw stop; file until it turns freely. Locate and rivet horn on underside of tab, directly in line with tube clamp and stop bracket on elevator. Refer to **Fig. 15-9** and parts drawing. Install wire swivel to horn and thread cable through swivel, eliminating any slack.

FIGURE 15-9



10. Set both trim lever and tab to neutral positions. Apply Loc-tite to wire swivel set screw and tighten to secure cable; trim excess cable. Test trim system; movement of cable and tab should be smooth and free of binding.

COVERING THE S-4/5 WINGS

The wings should be removed from the fuselage for covering. Set the wings on saw horses approximately 30" to 32" high. This makes the job less of a back bending effort! The wings should be complete including the root rib installation.

1. Install the aileron and flap teleflexes. **DO NOT** attach them to the retainers or they will protrude and inhibit slipping on the covering. Retain the teleflex cables to the anti-drag tubes with a loose zip tie.

2. Assemble the top and bottom ribs by inserting the tips as shown in **Figure 16-02** on the top ribs. Insert the contour fittings to point away from the curve of the rib. Insert the duck bill shaped tips into both ends of the bottom ribs. Note the mark on one end of the bottom rib denotes the forward end of the rib. Dimple the tube with a prick punch to lock the contour and tip fittings in place. Reshape the top ribs contour fitting as shown in **Figure 16-02A**. This will greatly ease the rib insertion and removal process.

FIGURE 16-02

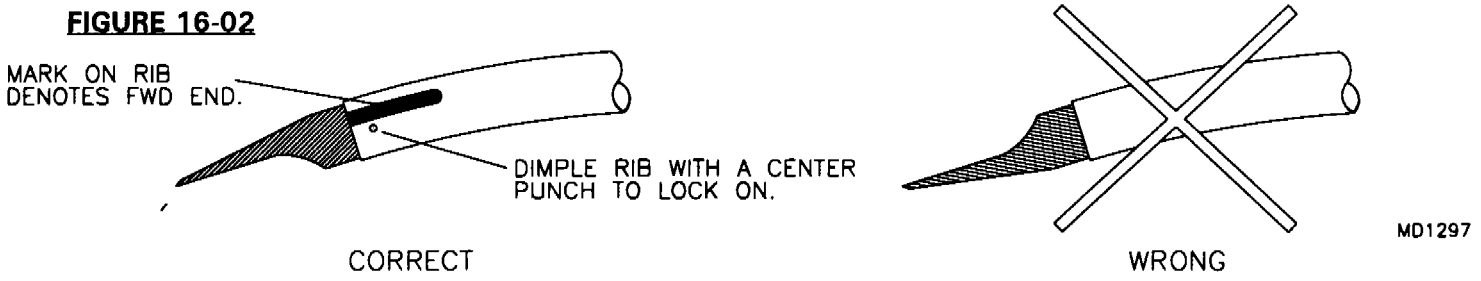
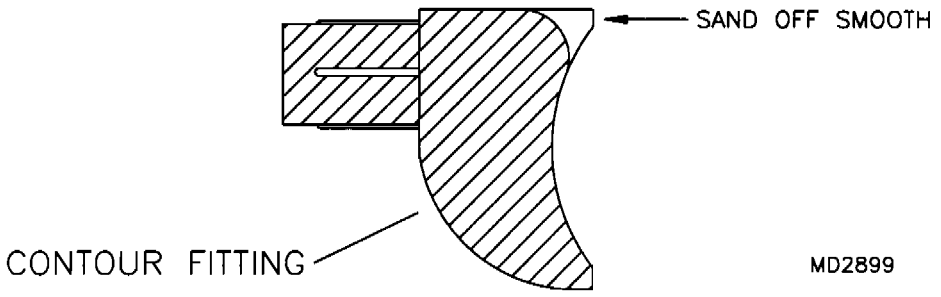
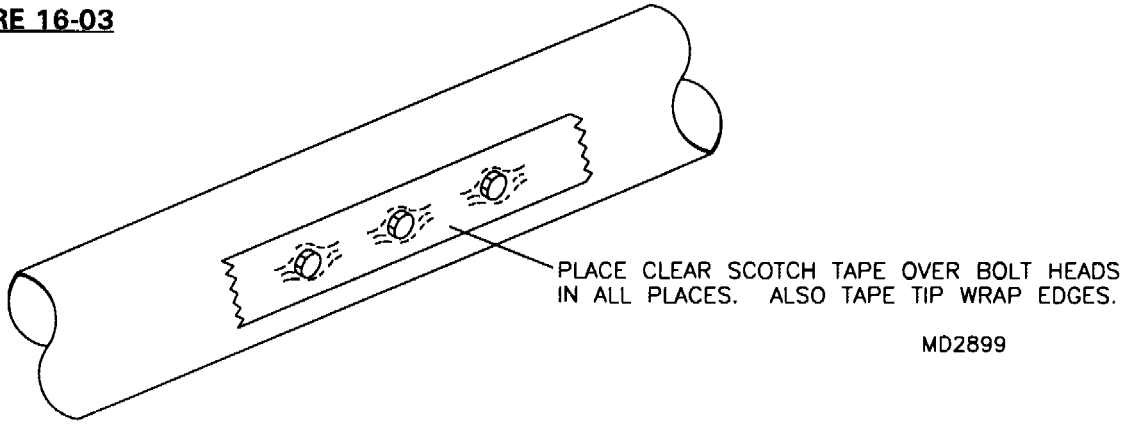


FIGURE 16-02A



3. Tape over all bolt heads with a good grade of plastic or scotch tape. See **Figure 16-03**. This will make it easier to slip on the wing covers.

FIGURE 16-03



Before skinning the wing, please inspect for completion and proper assembly using the following check list. Please note some items will apply to other models.

A. Is the teleflex for the ailerons or flaps installed? **IMPORTANT:** Do not tie wrap the teleflex cables tightly to the anti-drag tubes. These must be allowed to lay loose inside the wing for best operation. It also makes replacement easier.

B. Are all the bolts properly installed with the nuts tight?

C. Inspect all rivets, fittings, and nut plates. Make sure all hinge point nut plates are installed.

D. Is the pitot tube installed with the 1/4" fuel line?

4. Remove the wing cover (LH or RH) from the box and lay it on top of the wing frame, bottom side up, leading edge forward and the root end at the tip. Pull the open end over the frame. Have a helper feed it over the end while you pull it on. Go slowly, **DO NOT** force it on. If it becomes stopped or hard to pull, look to see where it is hung up. Stop pulling about 12" from the root rib, slit the first rib pocket on the bottom from the root as per **Figure 16-04** and install a top rib. Now pull the skin on the frame as far as possible to install it on the root rib. The reinforced edge of the wing skin should overlap the 1/2" tube of the root rib. See **Figure 16-04A**. Back out the 1/4" bolts that retain the root rib so the skin will reach the rib. Drill out pre-drilled holes in root rib to #28. Place the screws in the pre-drilled holes to retain the wing skin. Once the screws are installed the bolts are tightened until the proper tension is achieved. The root rib can come within a ½" of touching the "L" brackets when the skin is fully tightened. The trailing edge velcro gap seal should line up near center of the trailing edge spar. Up to ½" below center line is acceptable. See **Figure 16-04B**.

FIGURE 16-04

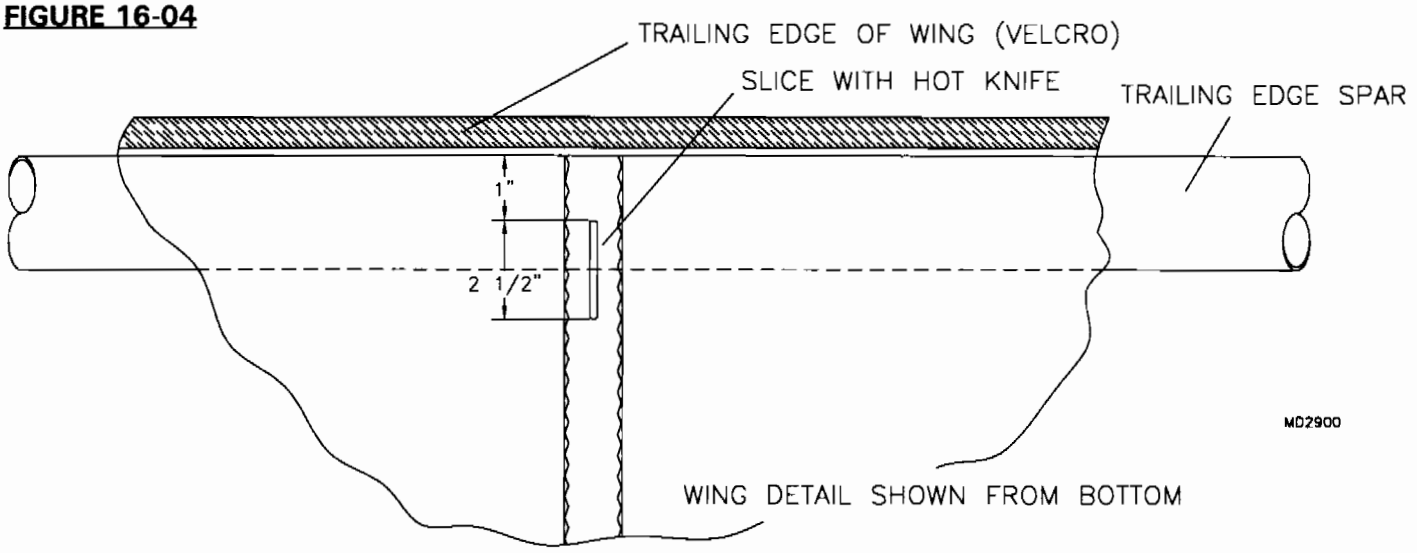


FIGURE 16-04A

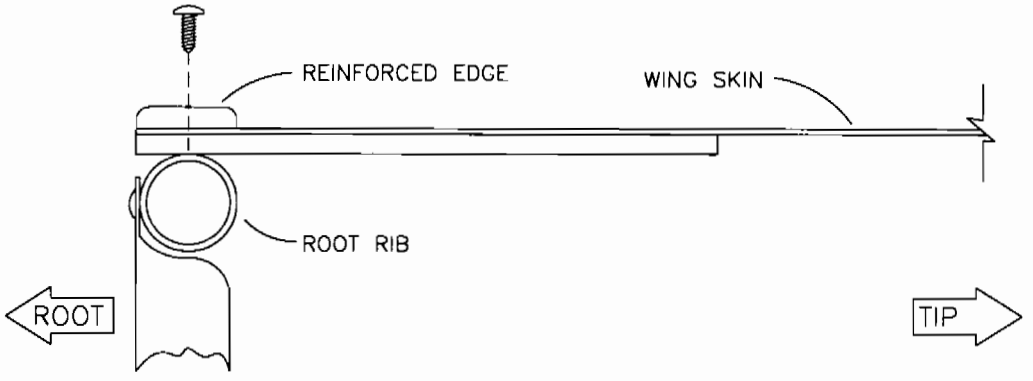
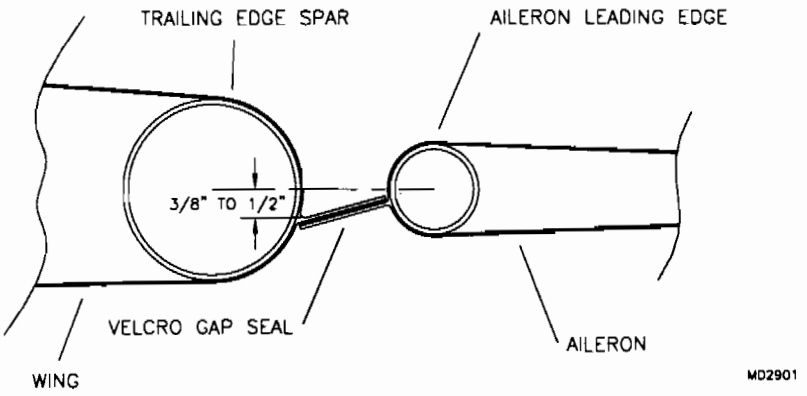


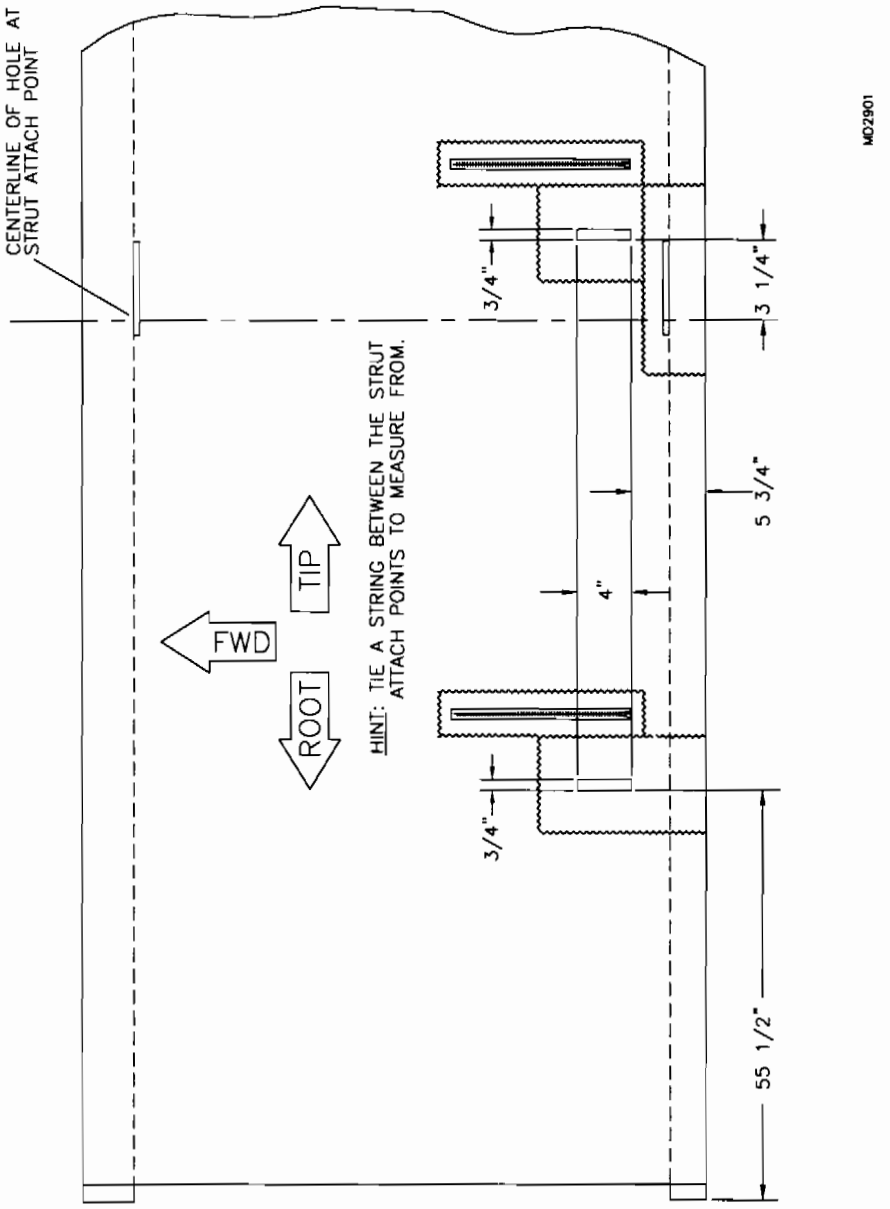
FIGURE 16-04B



UP TO 1/2" ACCEPTABLE ROTATION BELOW CENTERLINE OF T.E. SPAR

5. Cut a slit for each rib pocket. Refer to **Figure 16-04.** Make cut outs around the strut attach plates and jury strut tabs by following around the protrusion with a hot knife. Locate and cut additional holes for the flap and aileron exits as shown in **Figure 16-05.** Cut open each zipper. **Caution:** zippers will be damaged if the teeth are melted.

FIGURE 16-05

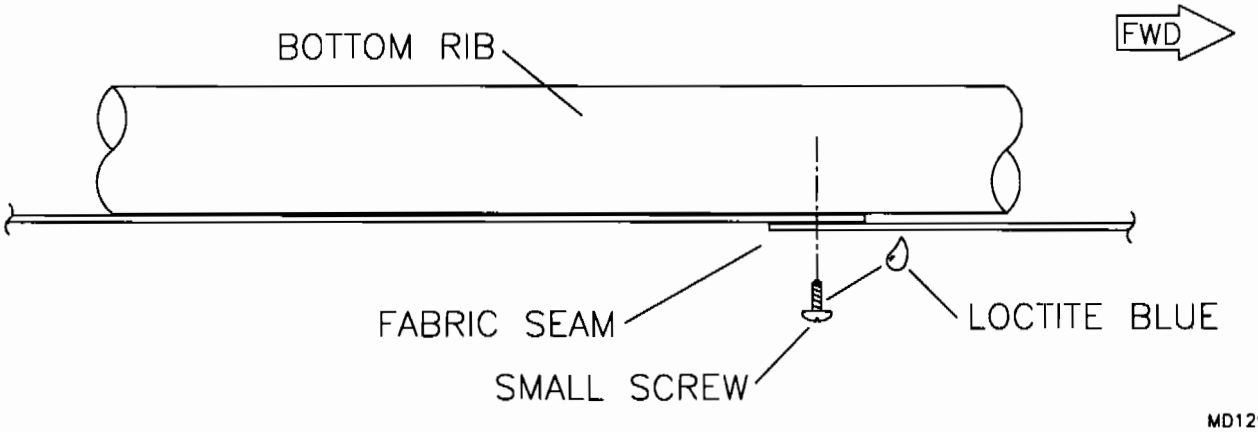


6. Install the top ribs through the slits made in the bottom pockets. **NOTE:** They should push in with a good degree of pressure. Use a small mallet and gently tap in place. A short scrap of lumber works as an excellent driving ram. That sound you're hearing is not the stitches ripping but the 2-way tape popping loose. This is perfectly normal and does not effect the strength of the skins. Install the bottom ribs the same way, except to get them started insert the rib upside down, this will help the tip slide into the pocket, then turn it right side up (curve down) before pushing in. The bottom rib tip will lay against the bottom of the trailing edge spar sealing shut the slit made for rib insertion. **PLEASE NOTE:** In some places rivets or nut plates will hang up the rib contour fittings. Simply move the rib to either side to clear. Rib removal is done by making a tool from an old screwdriver. Heat and bend the end into a 90 degree hook. Use the tool to reach up inside the slit to grab a rib and pull it out. Always remove the bottom rib first. Poke holes with the hot knife for the aileron and flap hinge bolts. Cut away the velcro gap seals the same as it was done on the flaps and ailerons. Use a hot knife to cut around the strut plates, jury strut attach tabs, fuel tank filler neck, and to open the zippers and all other openings.

7. If there are any wrinkles they will fade away after a couple of days. This is because of the expansion and contraction of the aluminum tubes. If wrinkles or fold lines remain, smooth them with a hot air gun. Be careful not to melt the skins, 350 degrees is the maximum temperature used. After 350 degrees the cloth will stop shrinking and start stretching. A model airplane heat gun used for shrinking mono-coat works great. An electric iron works also but can leave areas discolored. Also be careful of the heat setting.

8. To prevent the bottom rib from sliding out it is required to install a small screw. Locate this screw through the bottom fabric on a seam where the fabric is doubled, such as one of the stripes. Drill a #40 hole through the fabric and rib. Place a small amount of loctite on the screw and install. See **Figure 16-08.**

FIGURE 16-08



9. Attach the teleflexes, ailerons and flap hinges, etc. Bolt the flaps and ailerons to the hinges on the side that offers the best spacing and clearance. Use washers if needed to achieve proper spacing.

10. Install the rod ends to the teleflexes. Bolt the rod ends to the flap or aileron on the side of the horn that allows the teleflex the best alignment and smoothest operation. Use the parts drawing for hardware selection and assembly orientation. Rigging of the flap and ailerons will be done after the wings are on the aircraft. See C.G. Operations & Rigging.

S-4/5 INSTRUMENTS AND ELECTRICAL

1. Refer to the instrument and electrical wiring diagram on the parts page. Use the proper crimping tool for the terminals (available from most automotive supply stores like Big A, NAPA, etc). Route the wire bundle, like the throttle and choke cables, except use the other grommet at the firewall. Use nylon zip ties as needed. Position the ignition switches so that when in the up position they are off. Ignition switches work by grounding out the ignition system. Use the eye terminals on the switch and ground wires. Attach wires to the switch before installing. Loctite the nut.

Use the female spade connectors on the wires coming from the RPM and Hour Meter. Position the Hour Meter before the RPM. Trim the wires to fit at the engine.

2. Wrap the "Y" connectors in electrical tape, then shroud the wire bundle from the panel to lacing with the wire harness cover. The wire harness cover is a 4" wide black strip of webbing with velcro sewed to each edge.

3. Check the wiring installation. Are the wires properly secured to the airframe? Are the terminals crimped sufficiently? Tug lightly on the terminal, it should hold. Obviously, under crimped ends will pull out easily. Are the wires connected to the right places?

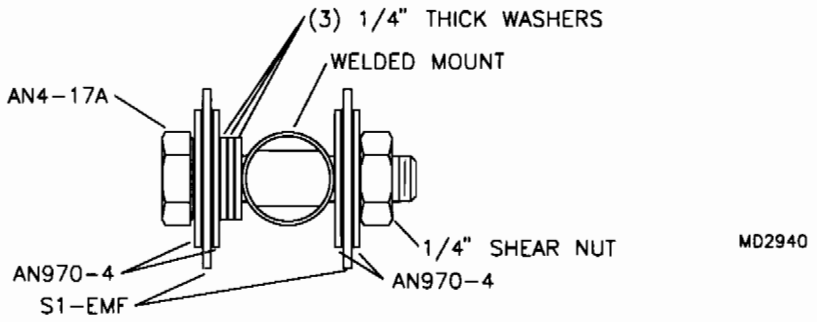
4. Use the extra fuel line for chafe protection on the fuel lines and plug wires. Slice the fuel line through one wall lengthwise, cut it to length and zip tie it to the appropriate place.

5. **SPARK PLUGS** Gap the plugs to the engine book specs and install. Use the plug wrench provided in the engine tool kit. Torque the plugs to 240 in. lbs. Connect the plug wires. Be sure the plug lead is fully on the plug.

INSTALLING THE ENGINE AND ENGINE MOUNT

1. Bolt the engine mount to the firewall using the hardware shown in **Figure 18-01**.

FIGURE 18-01



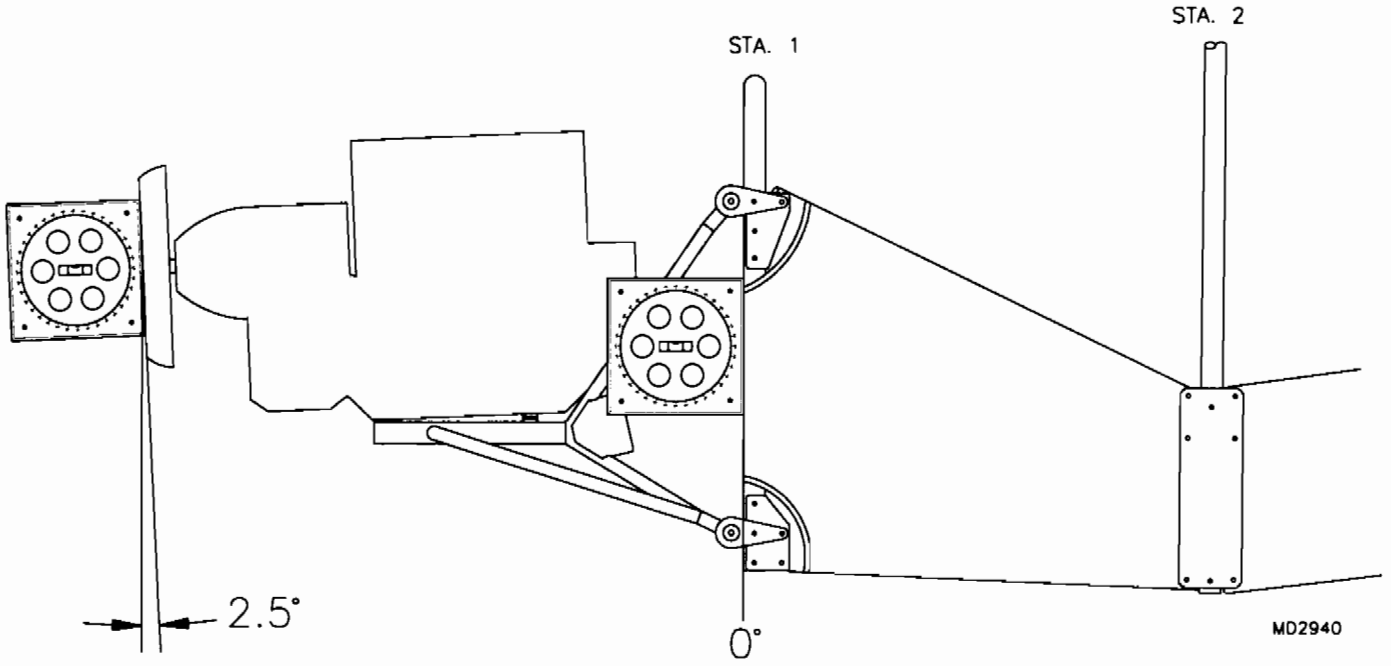
2. Bolt the mount plates to the engine mount as per the parts drawing.

ADJUSTING DOWN THRUST

3. With the help of a friend or hoist, lift the engine into place over the mount and lowered onto the mount plates.

4. Install the 4 lock washers and nuts to the engine studs. Check for proper down thrust by taking a protractor reading at the prop flange (vertical) and firewall. The correct amount of down thrust is 2.5 degrees. See **Figure 18-04**.

FIGURE 18-04



5. To adjust the engine down thrust, stack the 7/16" washers provided between the engine and the mount plates as required. Usually a stack of 3 washers on the aft plate will get the right reading.

ENGINE OFFSET

6. The Coyote I engine mount has the offset built into the mount. This may vary due to the nature of welded frames. Flight testing will reveal any excessive "P" factor, but a little left rudder is required in climb out. If your aircraft exhibits a tendency for the engine to pull to the right in level flight, you can do one or all of the following:

   A. Increase down thrust. This will work to reduce the "P" factor if your aircraft has a tendency to cruise in a nose high attitude.

   B. Add a rudder trim tab. A tab approximately 12" x 3" bent at 10 to 20 degrees can help to bring it into perfect trim.

   C. The vertical fin can be twisted using the forward top cables to effect the engine offset. In the case of the 447 or 503, the leading edge would need to move to the right and the vertical fin spar to the left. Use the adjustment holes in the cable tangs or stack washers with longer bolts to effect a twist to the fin.

7. Final check all the nuts and bolts prior to flight. Refer to the Rotax manual for the torque value on the stud bolts on the bottom of the engine.

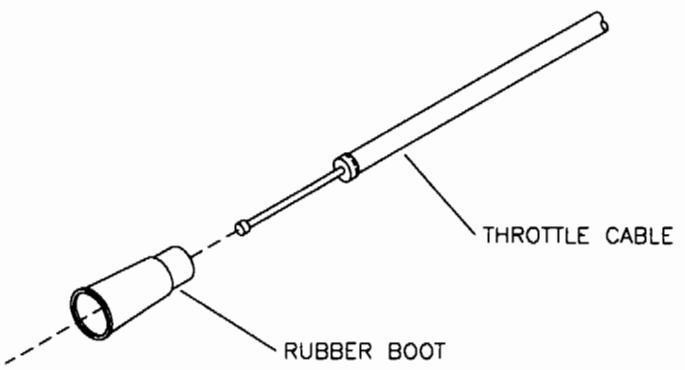
CARBURETOR AND THROTTLE INSTALLATION

8. Slip the black rubber intake manifold over the engine intake. The smaller opening is the carb side of the rubber manifold. Slip on the carburetor(s) and install the clamps. Position the carburetor vertical to the cylinders. See the engine manual for details.

FOR SINGLE CARB ENGINES

9. To hook up the throttle cable you need to unscrew the carb's top plate. Take care not to let the spring inside jettison the plate onto the floor. Remove the spring and cap and place aside. Look closely at the slider. See the white plastic fitting on the bottom? Underneath this should be the cer-clip that holds the fuel metering pin. Be sure when re-assembling the cer-clip is **under** the white plastic. Close examination will reveal where the cable terminates, but before hooking up the throttle cable first slip the little rubber boot over the end. See **Figure 18-09**. During re-assembly note where the throttle exists the cap is not on center. Position the cap so the cable is directly over its slider position.

FIGURE 18-09



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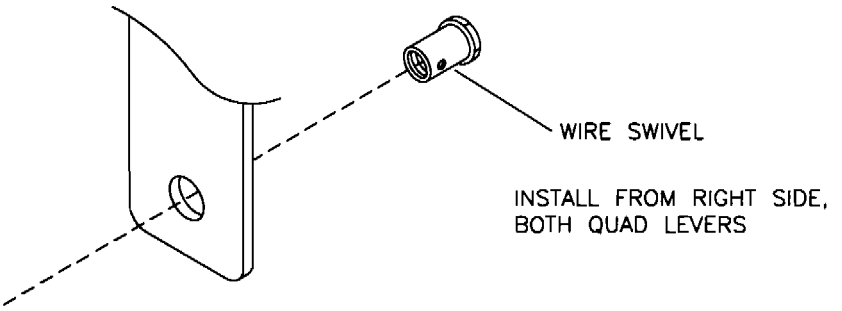
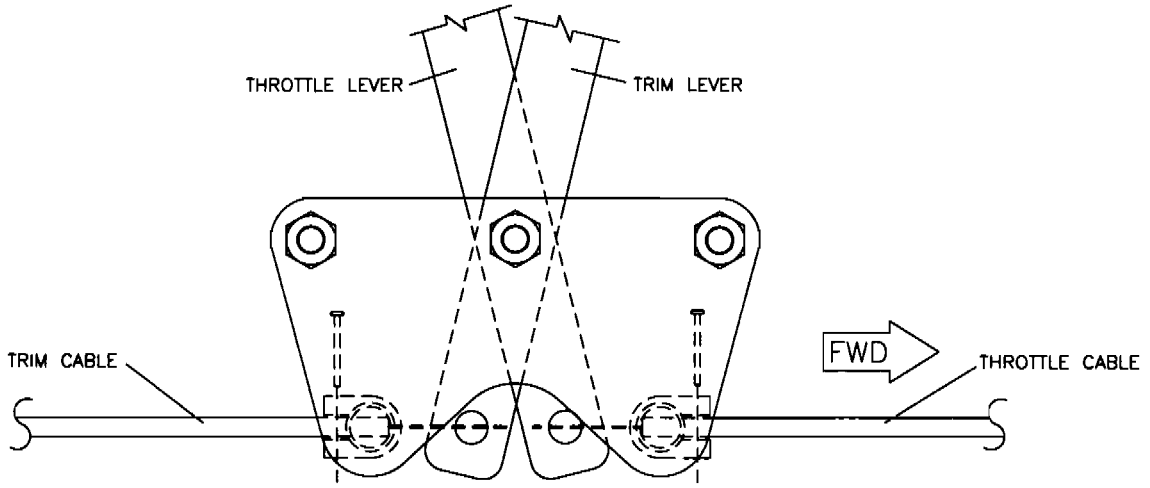
10. Pull on the free end of the cable to seat the housing into the fitting on top of the carb plate. Then route the cable to the throttle along the LH side of the cockpit. Double check to see if everything is curving gently, no sharp turns. Check to see if the housing is into the carb's top plate fitting. Mark the housing length at a point where it will enter the throttle stop tube and clamp and still have slack to adjust the seat either front or back. Then pull the housing away from the carburetor so the cable's free end will be inside past your cut-off mark. Cut off the excess housing and push out the cable. Check closely the housing where you've cut it. **A clean cut is a must!** The metal coil inside the housing can rub the cable and cause it to break. An unclean cut of either throttle or trim cable housing can also result in sticking of the levers due to the added friction. Tighten the cable housing clamp screws so the housing is retained against the stop tube. See **Figure 18-10A.** Slip a wire swivel through the throttle lever from the right side of the lever. See **Figure 18-10.**

FIGURE 18-10



MD1532

FIGURE 18-10A



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11. Slide the cable through the lever stop then through the wire swivel. **IMPORTANT**: Put a drop of loctite on the stop screw before inserting. **HINT**: Use a small piece of scrap lacing rope to tie up the seat so access to the quad is possible. Use a needle nose to hold the screw to thread it to the swivel. Once the screw is started, use the needle nose or wrench to hold the hex-shape end of the swivel while tightening the screw.

DUAL CARB AND OIL INJECTION THROTTLE INSTALLATION

12. Hook up the longer of the two short cable sets provided to the forward carb as instructed in the single carb set-up.

13. Take apart the splitter assembly and install the two throttle cables and if applicable the oil injection cable. Assemble with a single cable running to the throttle. Allow enough throttle cable slack so the seat can be adjusted fwd and aft and lifted up. Route the cable as per the single carb instructions.

14. Adjust the carbs and oil injection cables using the adjustors mounted on each carb and oil injector so that all open and close together.

15. Check for proper operation. The throttle lever friction can be adjusted with the levers pivot bolt.

PROPELLER INSTALLATION

16. Check the propeller for balance by inserting a 1" tube through the prop center. Open a bench vise slightly wider than the prop. Position the prop horizontal with the tube resting on the vise's jaw. If it is balanced it will remain level or any position it is set at. Provided your vise is level across the prop and the jaws are smooth. If the prop drops at tip balance, coat the light tip with a urethane spray varnish.

17. Bolt the prop to the engine using the bolts called out on the parts drawing. Do not thread bolts into the flange instead install the bolts to pass through the flange using the larger bolt holes. Get all the bolts started before tightening. Check the bolt length by inserting through the prop and crush plate, the shank of the bolt should not be visible. If so, use washers under the head to prevent this. A maximum of three is permissible any more require a shorter bolt.

18. Torque the bolts in a crossing pattern to 10 ft. lbs. Re-check the torque.

19. Check for prop tracking by turning the prop vertical and placing a stationary object on the floor touching the prop tip. Turn the prop over and check to other tip. If there is a difference, loosen the bolts and re-torque. Check again. If you cannot get it to "track" equal, check first:

1. Was the prop positioned the same each time?
2. Any debris between the prop and flange?
3. Are you measuring to the same place on each prop tip?
4. Has the stationary object moved?

MUFFLER INSTALLATION

20. Collect the parts depicted in the parts drawing.

21. Install the exhaust manifold to the engine as shown on the parts drawing. Consult your Rotax engine manual for the proper torque on these shoulder screws.

22. Attach the elbow and muffler to the manifold using the springs. **CAUTION:** Use a smooth hook such as an old screwdriver with the end bent 90 degrees for the hook. Use of a vise grip will nick the spring and cause breakage.

23. Bolt the aft end of the muffler to the muffler mount as per the drawing in the S-2 section.

COWLING INSTALLATION

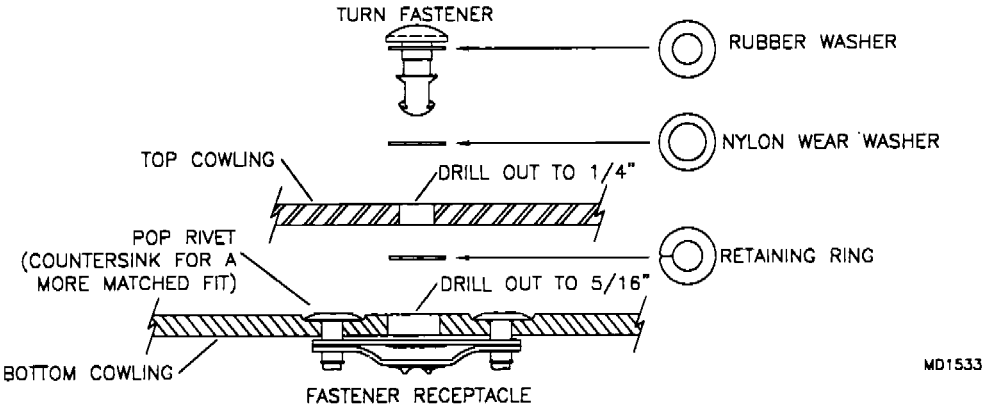
PLEASE NOTE: The cowling comes trimmed, painted, and ready for installation of the 1/4 turn fasteners and cutting open the holes for the air filters. For the best fit, the engine (less the air filters) and bottom half of the cowling should be bolted in place.

24. Locate the (4) AN3-14A bolts and cowling retainers. Bolt the retainers into the nut plates on the top and sides of the S-1.

25. The cowling is retained to the airframe with (6) retainer tabs. The two top and side holes are for the AN3 bolts. The sheet metal tabs on the bottom retain the cowling with screws and tinnermans. The bolt holes in the cowling are pre-drilled, but may need slotting to get a perfect fit. Be sure the cowling is fitted and positioned just where you want before locating and attaching the bottom tabs. The bottom tabs will be attached in a later step.

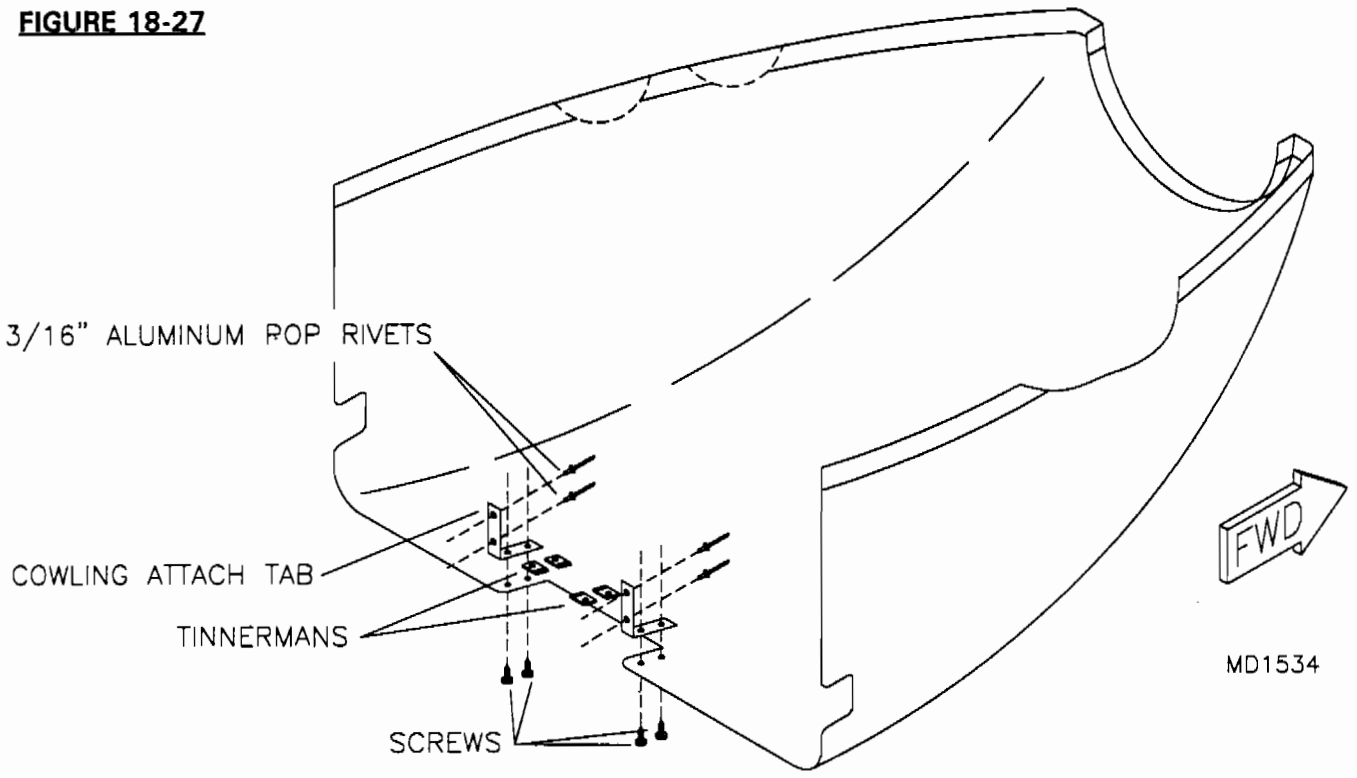
26. With the top and bottom cowling together, transfer drill through the #30 holes with a #11 drill bit. Cleco as you go. Separate the cowlings and cleco the 1/4 turn receptacles to the bottom cowling. Using a #40 drill bit, drill both mount holes for the receptacles. Remove the receptacles and drill the 1/4 turn hole out to 5/16". Countersink the #40 rivet holes to allow the rivet heads to sit flush. Install the rubber and nylon washers onto the 1/4 turn stud and install the 1/4 turn studs into the top cowling. Install the retaining rings onto the 1/4 turn studs then install the 1/4 turn receptacles. See **Figure 18-26**.

FIGURE 18-26



27. Bolt the bottom cowling to the side retainer tabs with the plastic washers between the bolt head and cowling. During final assembly, install the plastic washers between the cowling and the mount tabs. Next attach the top cowling to the bottom. Line up the two bolts with the top tabs. **TIP:** The cowling position can be shifted to line up level and straight with the airframe by filing slots at the bolt holes. Be sure the cowling fits over the windshield on the S-1. For the best engine cooling, the exhaust air duct must fit snug against the top of the engine. Once you are happy with the fit of the cowling to the firewall, the lower tabs will need to be installed before removing the top cowling. Place the cowling attach tabs against the firewall and flush with the edge of the lower cowlings cut out. Clamp the tabs in place. Mark and drill the holes to #11 and install the tinnermans. Refer to **Figure 18-27** for more details. Secure the cowling bottom with four screws and tinnermans.

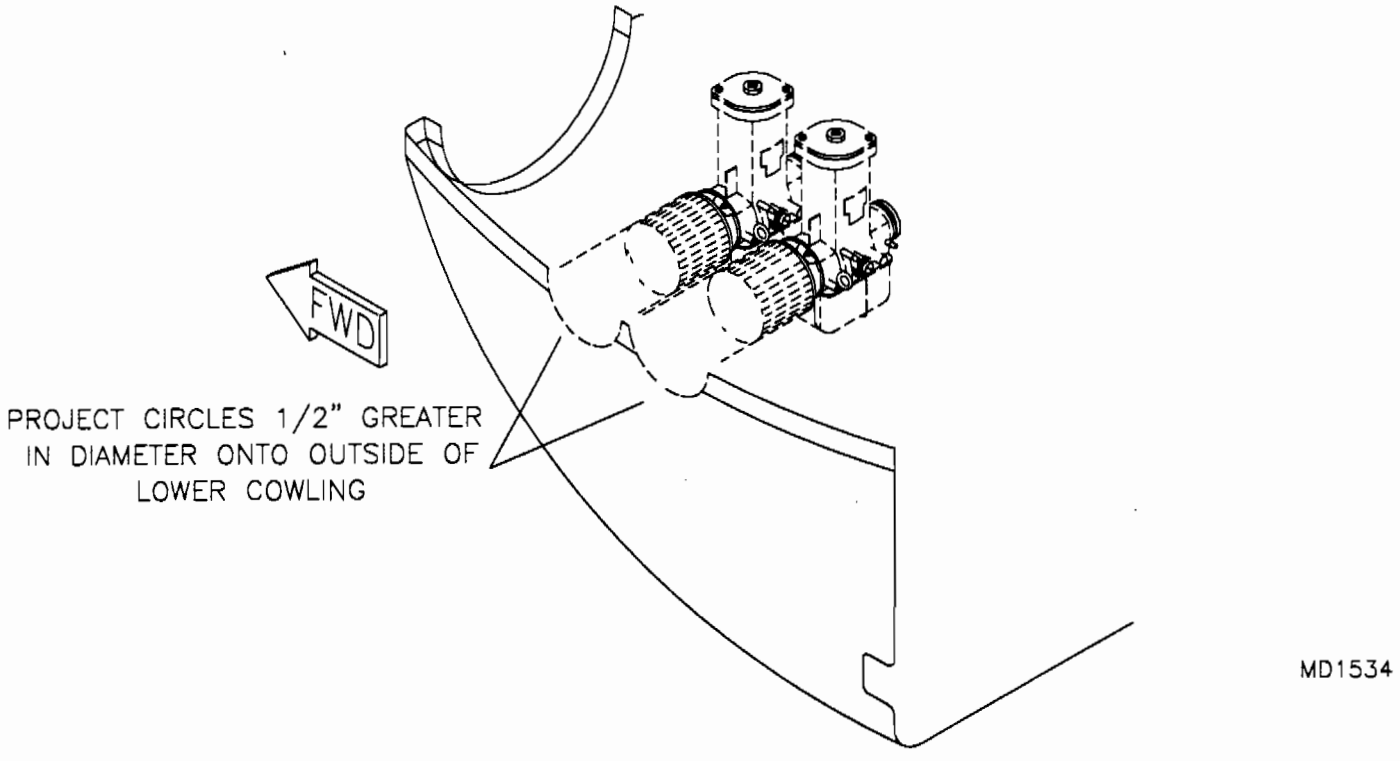
FIGURE 18-27



28. The cowling with spinner should fit with the spinner centered and with more opening **below** the spinner. Make slots in the cowling at the side and top tabs to adjust the position if required.

29. Remove the top cowling and locate the air filter(s) holes by projecting outward from the carb(s). Mark on the inside of the bottom cowling a circle ½" greater than the diameter of the air filter(s). Place masking tape on the outside to protect the paint. Cut out with snips or a jig saw. Sand around. Install the top cowling and complete the circle by taping the top cowling where the cut will be made and draw on the tape. Trim out and sand the top cowling. See **Figure 18-29**.

FIGURE 18-29



FUEL SYSTEM ASSEMBLY

GENERAL GUIDELINES FOR FUEL SYSTEM ASSEMBLY

(A). Route lines to curve without kinks or chafing against the structure.

(B). Hold lines in place with the plastic zip ties provided. **DO NOT** over tighten and kink the lines.

(C). Keep the lines away from sources of heat and electricity.

(D). Safety wire or clamp all connections including the primer lines.

(E). Firewall exit of the fuel line should be on the side of the carburetor.

(F). One Operational Note: Fill the tanks to within ½" of the filler neck bottom. This will reduce overflow.

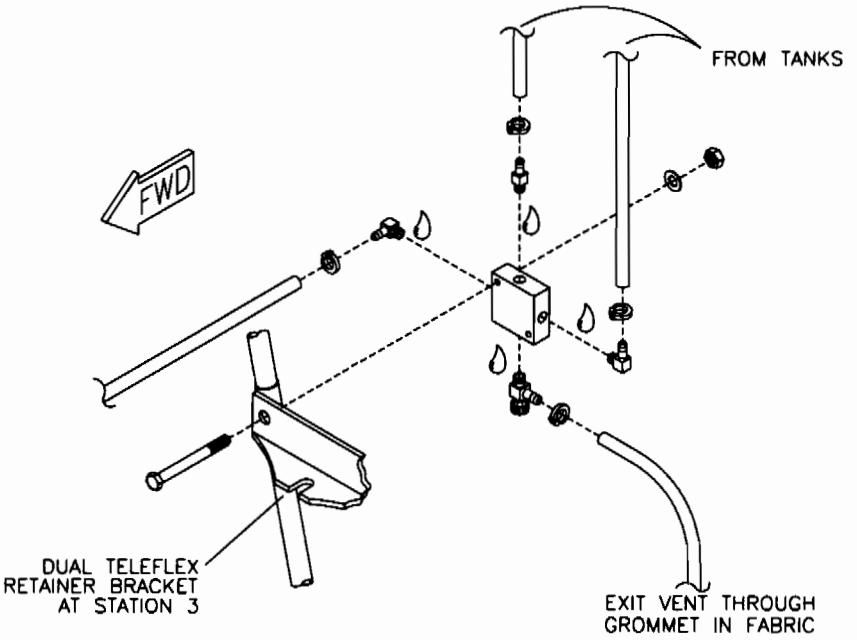
(G). Remember water doesn't flow uphill and neither does fuel. Avoid running lines that routes above the fuel source.

(H). Put blue loctite on all screw-in fittings.

1. At this point, the fuselage is complete with the covering and engine. The wings may be installed, but is not required. If wings are not on at this time, it only means the fuel lines going to the tanks will require trimming to length.

2. Install the fittings and valves to the mixer block and bolt to the aft, right side of the dual teleflex retainer. See **Figure 19-02.**

FIGURE 19-02



3. Install 3' lengths of fuel line to the two fittings pointing in the upward position.

4. Install a length of fuel line to the sump valve that is long enough to reach and exit through a nearby belly lacing grommet.

5. Install fuel line to the last fitting on the mixer block by routing it from the engine and firewall's left side. The fuel line is routed between the skin and lacing cord on the forward, left side of the cockpit and then crosses the cockpit at the S-2. Route the line across the S-2 on the under side of the top crossing tube. Continue aft to the mixer block by placing the line in between the lacing cord and skin on the cabin's right side.

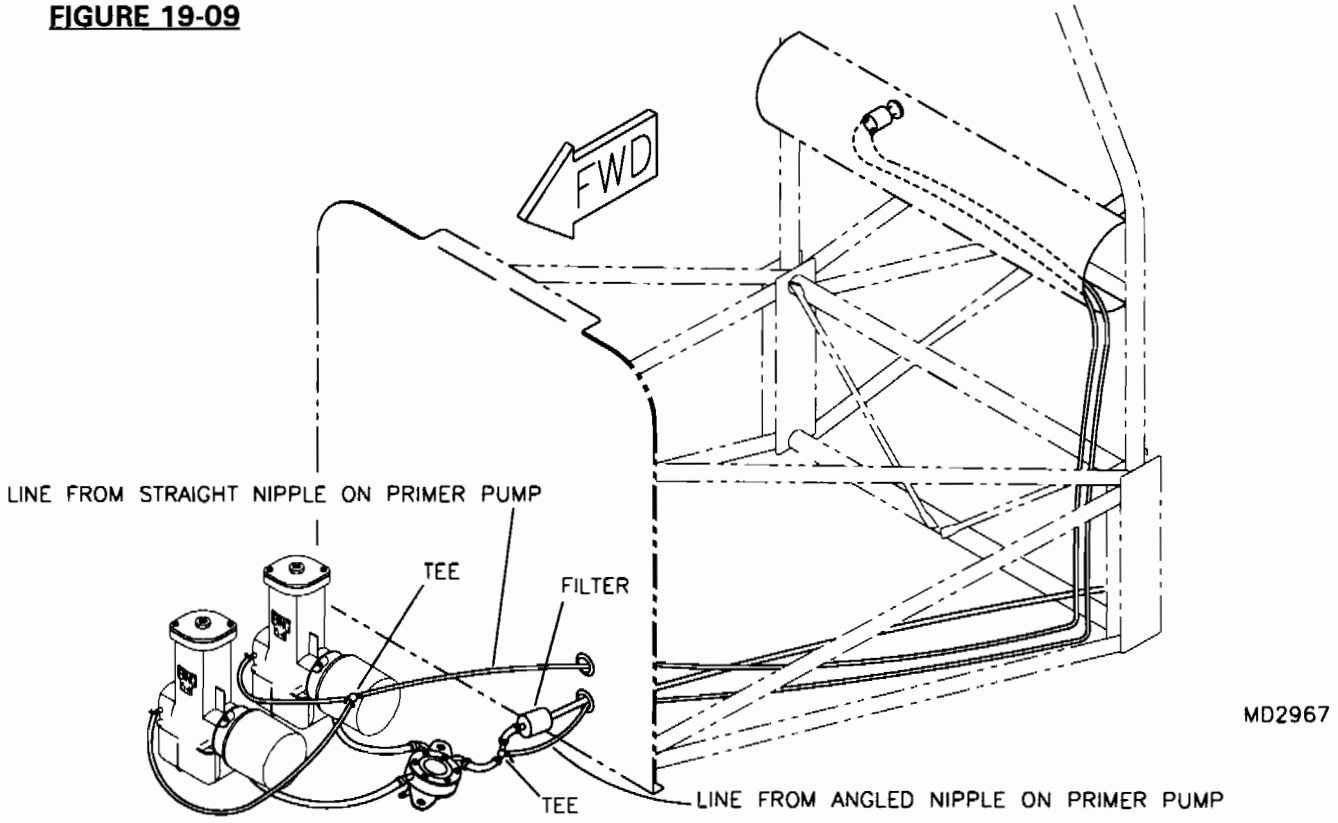
6. Install the shut off valve and primer bulb by cutting and inserting into the fuel line on the cockpit's right side.

7. Secure the line with zip ties as required.

8. Route the lines from the primer out the left side of the instrument panel down the S-2 and forward along the 1/4" fuel line.

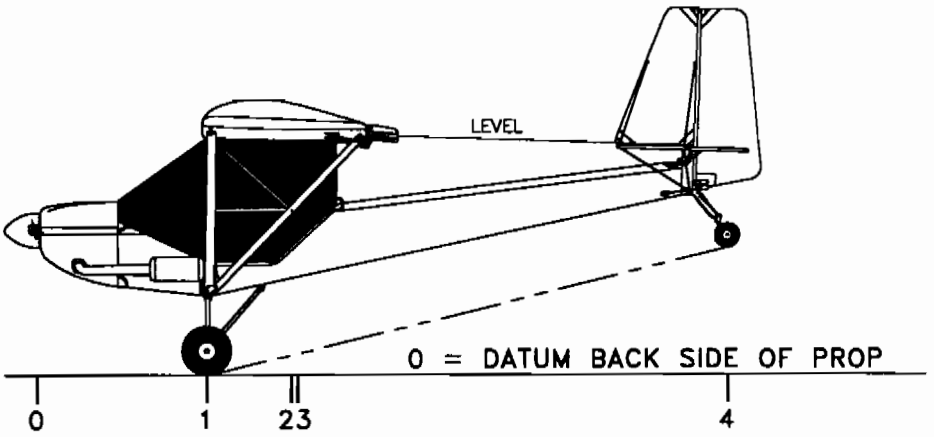
9. Connect the lines to the carb(s), fuel pump and filter as per **Figure 19-09**.

FIGURE 19-09



10. Secure all lines forward of the firewall and make stand offs for the fuel filter using short segments of fuel line and zip ties. Refer to the photos of the 503 dual carb for details.

11. After the wings are installed, connect to the fuel tank(s) directly or with the "Y"'s as shown on the parts drawing. Use the straight barbs as a method to disconnect the fuel lines when removing the wings. A nice option is quick disconnects that allow fuel to remain in the system, provided the tanks are not so full that fuel runs out once the wings are removed. Call our parts department for the fuel line disconnects.



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N_____	
DATE WEIGHED	
ENGINE TYPE	
C.G. CONDITION	
EMPTY WEIGHT	
MTOW (447)	587 LBS.
MTOW (503)	587 LBS.

RANS S-4 COYOTE
WEIGHT AND BALANCE

ACCEPTABLE C.G. 62.5" TO 69.5" FROM DATUM

SAMPLE WEIGHT & BALANCE (S-4 CONVENTIONAL GEAR)

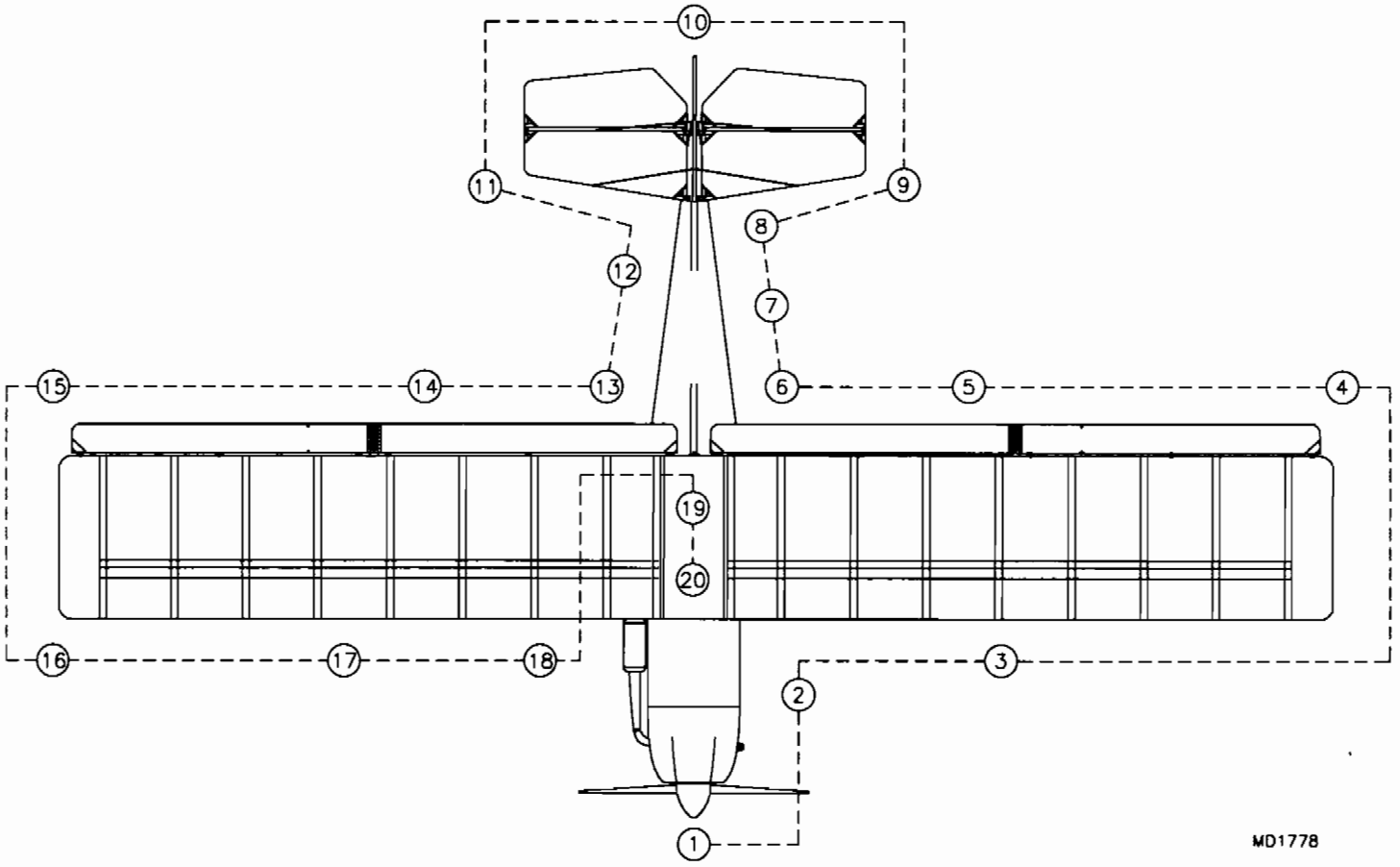
#	ITEM	WEIGHT	ARM	MOMENT
1	MAINS	406	56.0"	22,736
2	WING FUEL	54	69.0"	3,726
3	PILOT	170	69.0"	11,730
4	TAILWHEEL	19	199.0"	3,781
	TOTAL=	649	TOTAL=	41,973

$$\frac{\text{TOTAL MOMENTS}}{\text{TOTAL WEIGHT}} = \text{C.G.} \qquad \frac{41,973}{649} \quad 64.7"$$

#	ITEM	WEIGHT	ARM	MOMENT
1	MAINS		56.0"	
2	WING FUEL		69.0"	
3	PILOT		69.0"	
4	TAILWHEEL		199.0"	
	TOTAL=		TOTAL=	

$$\frac{\text{TOTAL MOMENTS}}{\text{TOTAL WEIGHT}} = \text{C.G.} \qquad \text{_____} =$$

COYOTE PRE-FLIGHT INSPECTION



1. Inspect the engine, mount, propeller, prop bolts, gear reduction system, gear box oil level, cowling security, plug wire, air filter, carburetor(s) position and clamp tightness.

2. Check the wing connections. Are all pins and bolts in place? Any signs of wear, cracks or bent tubing?

3. Inspect the strut connections. Be sure to safety the clevis pin. Look down the wing spar for bends. Is the covering taut? Open the zipper and look inside. Check the controls and inner wing structure.

4. Pre-flight the ailerons and flaps. Are the ribs in place? Hinge points secure? Do the teleflexes have any play? Does the control system operate freely? Do the flaps operate correctly?

5. Look over the jury struts. Are they bolted properly? Ribs in place? Is the trailing edge spar straight and intact?

6. Check the center cover for proper fit. Are the cinch straps laced and tight? Is the keel intact? Any dings, bends or skin abrasions?

7. Look over the tail cone area. Check for bent tubes, holes or tears in the fabric.

8. Inspect the tail surface connections to the tail cone. Are the fittings intact? All the bolts in place and secure?

9. Pre-flight the elevator. Move it up and down checking the hinge points.

10. Move the rudder. Inspect as in Step 9. Look over the tailwheel. Is it properly inflated? Check the steering rods. Does the tailwheel move freely when the rudder moves? Are all control surface hinge points well lubricated and moving freely?

11. Repeat Step 9.

12. Repeat Step 7.

13. Repeat Step 6 plus check both fuel valves for on position (screw out) and is the filler cap closed?

14. Repeat Step 5.

15. Repeat Step 4.

16. Repeat Step 3.

17. Repeat Step 2.

18. Repeat Step 1.

19. Check the cockpit over. Is the seat adjusted? Move the stick. Is everything moving as it should? Check main bulkhead bolts and nuts. **DANGER:** The 5/16" bolts that retain the keel to the bulkheads must be secure. Inspect nuts for snugness. These nuts can vibrate loose it the nut's nyloc is worn. Wear can be induced by removing and installing the doors. Use new nuts if you even doubt the locking power of these nuts.

20. Climb aboard and go through the cockpit check list.
    Buckled in?
    Helmet on and head, too?
    Move the controls. **NOTE:** Avoid pushing the rudder pedals unless rolling.
    Set altimeter.
    Note fuel quantity.
    Note Hour Meter reading and time.
    Set engine controls.
    Switch on ignition.
    Pull the starter.
    Have you checked the weather, traffic.
    Have FUN!!!

ENGINE OPERATIONS

Provided with the aircraft is an engine manual authorized by the engine distributor. This is a well written manual explaining many specifics for continued safe and reliable operation of your engine. We urge you to read and fully understand this manual. In addition, please find the data below helpful in obtaining the most out of your aircraft.

After your **COYOTE** has been test flown and the engine is already broke in, some maintenance will need to be performed within the first 10 hours. Refer to the Engine Manual for correct procedures.

STARTING

Position the aircraft into the wind and chock the main wheels to prevent rolling. To maneuver the aircraft into position, lift the tail at the strut connect points. Avoid lifting at the tips of control surfaces. **CAUTION:** Winds above 15 mph may cause the aircraft to lift off when empty. Have an assistant sit in the plane or help hold it down at the wing strut connect points. Never hold a strut in the middle!

It is best to start the plane from inside the cockpit. Do so by first sitting on the seat pulling up your knees and rotating into position.

Pump the primer 2 to 3 times. Close the throttle by pulling back. Flip the ignition switchs up for on. Move the control stick to the left. Grab the starter handle and pull briskly. Several pulls may be needed. Be sure the ignition is on (switch up). Let it idle a moment and then advance the throttle slowly. **NOTE:** After the engine warms up, close the throttle. It should idle at 2,000 rpm. If not, refer to the engine manual for details on setting the idle. If you encounter starting difficulties, refer to the engine manual for probable causes and solutions. **CAUTION:** In cold weather allow at least a 3 minute warm up before applying take-off power.

Check throttle action. There should be no sluggish response from mid range to top end. Do not rapidly pump the throttle. This is not a motorcycle! It is an airplane with a big fly wheel, the propeller.

Jockeying the throttle will only accelerate wear on the engine and make its reliability questionable. Be smooth with the throttle and it will respond when you need it.

REASONS FOR POWER LOSS

Never take off if the **PLUG IS FOULED**. This will be indicated by sluggish throttle and lack of RPM. Two stroke engines do not unfoul their plugs. They only get worse. So flying to "clear it out" may result in a power loss and a forced landing. The most common cause of fouling is improper fuel/oil ratio. Follow the engine manufacturers recommended oil ratios. Extended idling can also foul plugs.

WORN PLUG: Again, throttle and rpm are not normal. Replace with fresh, properly gapped plugs.

CLOGGED AIR FILTER: Spit back, the tendency at low rpm's for the engine to throw fuel out of the carb(s) and into the air filter causes the oil/fuel mix to eventually clog the filter. The situation worsens rapidly because the more clogged the air filter becomes the more fuel that spits back. This can occur on a COYOTE about every 20 hours. Therefore, it is recommended to clean and re-oil (with air filter oil only) the filter on a periodic basis. Clean and re-oil as per the filters manufacturers recommendations.

INSPECTION OF ENGINE SYSTEMS

Cowling:

- Missing Screws
- Loose Bolts
- Cracked Fiber Glass
- Cracked Mating Flange
- General Condition

Remove the Cowling and Inspect for the following:

- Cracked Welds
- Missing or Bent Bolts and Loose Nuts
- Elongated Holes or Cracks in Mount Plates
- Deteriorated Rubber Mounts
- General Condition

Carburetor(s) and Throttle Quad:

- Position (90 Degrees to Cylinder)
- Clamp Tightness
- Throttle and Choke Cable Wear
- Smooth Throttle and Choke Action
- Loose or Missing Bolts or Screws
- General Condition

Muffler:

- Spring Tension
- Cracks in Manifold and Welds
- Worn or Broken Hanger Bracket
- Clearance from Airframe and Gear Cables
- General Condition

Fuel System:

- Leakage Anywhere in the System
- Cracked, Worn or Ruptured Fuel Lines
- Firm Connections
- Fuel Pump Integrity
- Weathered or Worn Primer Bulb
- Fuel Tank Integrity
- Fuel Filter Clogs
- General Condition

MAINTENANCE

COVERING

The Coyote is covered with 3.9 oz. per square yard of dacron sailcloth. This dyed-to-color material will last several years if the plane is stored out of direct sunlight while not in use. Ultraviolet light is the main reason for loss of skin strength. The telltale signs of an aging skin are: color fading, embrittlement and easily torn with rips likely to enlarge. To preserve your covering, there are now several protectants and coatings than can be applied. For a detailed video on how to apply a good clear coat, call the factory.

CLEANING

For a major cleaning, we use damp towels and soapy water and dry with clean towels. Remove any greasy dirt with a 409 spray cleaner.

IMPORTANT: If you conduct flight operations near or on salt water such as landing on beaches or float activity, a thorough fresh water washing is a must after each final flight of the day. This should be done as soon after the flight as possible. Saltwater can be the cause of serious corrosion problems for key structural elements. Internal rinsing of spars, struts and fuselage members with fresh water is required if the plane has been excessively wetted or submerged in salt water.

During cleaning of any type inspect the craft for signs of corrosion and any other abnormalities.

AIRFRAME UP KEEP

The aluminum structure is designed to last for many years. However, constant abuse through hard landings and high speed flight in rough air could fatigue key structural elements. To inspect the airframe, look for cracks, hole elongation, flecking of anodizing (indicating bends or overloads), bent, dented or corroded tubing and any signs of misalignment or distortion. Consult your dealer or the factory if your inspection reveals trouble or in the event of accidental damage beyond your capabilities or repair.

GENERAL DESCRIPTION, FLIGHT PROPERTIES & CONSTRUCTION

DESCRIPTION

The Coyote is a high wing, tractor, mono plane with conventional or tricycle landing gear. It is strut braced with aluminum tubing construction. It has Dacron sailcloth pull-on covers.

The design features a roll cage construction, an enclosed cabin when optional side doors are installed, shock absorbing "Cub" type gear, steerable nose or tailwheel, ailerons and optional flaps.

FLIGHT PROPERTIES

The Coyote's flight properties are conventional in respect to general aviation aircraft in the areas of control and response, with the exception of a greater decay rate due to its light but "large" nature. This is typical of any lightweight plane, where little kinetic energy is to be had.

TAKE OFFS

Take offs begin with a good amount of left rudder to counteract the P factor. This diminishes once the tail is up. Do not force the tail up early; hold a neutral stick pitch. Rotation generally occurs at 25 to 30 mph with climb out at 45 mph. 45 mph with no flaps will generally yield the best rate of climb. Use 2 notches of flaps for shorter take-offs. Raise flaps slowly.

STALLS/SPINS

Stalls are preceded by an easily distinguishable buffet caused by the turbulence over the horizontal stabilizer from the inboard wing stall. During this root stall, there is sufficient lift and control to maintain flight. Once the entire wing stalls, the nose falls through and a high sink rate develops (approximately 800 to 1,000 fpm). The craft can be held wings level with the rudder. (**NOTE:** During this "Falling Leaf" condition we assume full up elevator is applied.) The plane may make a couple of gentle 10 degree pitch ups if the deep stall was entered from an exceptionally nose high attitude. Nonetheless, it will rapidly settle into a slightly nose high mush until back pressure is released.

If, during a deep stall ("Falling Leaf") the pilot's feet are removed from the rudder pedals, the Coyote will begin to dip each wing alternately until finally making a tight spiral to the right (due to engine torque). Then the plane may return to wings level only to re-enter the spiral (**NOTE:** This is not a spin!) or it may continue into the spiral. At this point it could be argued that it is spinning. However, rotation is not through the plane's center of mass. Instead, it is as if it were riding down the sides of a vertical cylinder. Thus, a spiral. To further support this, the spin properties are very conventional. Entry requires full deflection of elevator and rudder and must be held in full deflection.

The spin's rotation is approximately 80 degrees nose down with rotation through the center of mass, almost through the aircraft centerline (10 degrees from it). Rotation speed is 1.5 seconds per turn. This is reached after the second rotation and will not increase. Flight tests show no rotation increase even after 30 turn spins. Sink rates average 1500 to 2000 fpm, with 200 to 400 feet lost per turn depending on density altitude.

This spiral and spin difference is easily recognized as well as controlled. Stall and spin testing in all configurations has been done with no unusual characteristics revealed.

In conclusion, the Coyote will spin only if fully stalled and ruddered. Recovery can be effected in 1/4 turn using opposite rudder then pitch and in 1 1/4 turns by neutralizing the controls.

As a result of the excellent stall warning and positive control ability, the Coyote can be used as a S.T.O.L. aircraft. Take offs can be as short as 60' in no wind. Angle of climb can be 25 degrees to 35 degrees at 30 mph, 600 fpm and full flaps.

PROHIBITED: Spins with flaps.

Avoid prolonged flight at high power settings and slow speeds. This flight mode causes violent, turbulent airflow over the tail with associated "tail buffet". This can be felt in a stick shake. This is a warning of an impending stall and to decrease the angle of attack and increase airspeed.

APPROVED MANEUVERS AND SPECIAL OPERATIONAL CONSIDERATIONS

-Stalls, all types except Whip Stalls
-Falling Leaf at low power settings (below 4,000 rpm)
-Chandelles
-Lazy Eights
-Spins at low power settings and without flaps only!

ALL AEROBATIC MANEUVERS EXCEPT THOSE APPROVED ARE PROHIBITED!

FLIGHT MANEUVERS THAT INDUCE NEGATIVE LOAD: May cause fuel leakage through the vent cap and momentary fuel starvation due to the negative G's on the float style carburetor. Avoid low level abrupt pull ups followed by an abrupt dive.

WARNING: SECURE ANY FORMS OF CARGO: Also, be careful of clothing articles falling into any part of the aircraft's working mechanisms. Jamming of the controls may result. Always wear the safety belt and shoulder harness to be sure these also do not interfere with the controls.

CHECK THE CARBURETOR(S): Check during pre-flight for clamp security. After a few hours the fuel/oil mix will lubricate the rubber intake manifold. It is then possible for the carburetor(s) to rotate into a position that may cause fuel overflow and possible fuel starvation. Remove, clean and re-clamp.

FUEL SHUT OFF VALVE: This must be on for flight. Always check it. There's enough fuel retained in the system past the valve to permit a take-off followed by a dead stick landing!

LANDINGS

Landings of all types have been performed. Airspeed and power must be watched closely when executing a slow (below 40 mph) approach. A high sink rate will develop and power must be used to arrest the sink.

The normal landing consists of maintaining 45 to 50 mph on approach and keeping power on until in the flare at approximately 3'. Touch down speeds should be in the 25 to 30 mph range. Roll-outs can be under 150 feet if a proper approach is flown. Using brakes, a roll out can be as little as 75'.

Full flaps can be used to lower approach speeds by 5 mph.

DISASSEMBLY FOR TRANSPORT

The distance, terrain, weather and type of trailer will determine how much disassembly you must do to transport your Coyote. Usually we fold the tail and remove the wings and hang them on the wall of an enclosed trailer.

CAUTION: Be **VERY** careful when disassembling and transporting your craft not to gouge, scratch any structural aluminum components (struts, spars, etc). Avoid any method of dismantling or packing that can cause damage to any part.

TRAILERING & TOWING PRECAUTIONS

When towing long distances on an open trailer remove the tail surfaces. Highway speeds and gust loads can cause undue loads on the tail group. Make certain the wings and tail components are secure and will not catch the wind underneath. Tie down the wings about 2 ft in from the ends and also in the middle.

CAUTION: If you must tow tail first with the tail group assembled lock the rudder and the elevators with a control lock. Haul like this only in moderate surface winds and drive below 35 mph. This method works fine for a few miles like to the site but is not suited for long hauls.

CORROSION and WASHING YOUR PLANE

Using the garden hose to wash the outside of your plane may seem like a great idea, however this is a practice avoided at the factory. We simply never let the plane get to the point it needs hosing. Instead, the exterior of the plane is cleaned using a product called Brilliance. This mild cleaner works great on all surfaces including the Lexan. For the oil or exhaust stains, we use 409 or Fantastic. These clean very effectively without apparent damage to the paint.

If your plane is open air like an Airaile or Stinger and you do use a hose to wash it down, you may be causing a future corrosion problem. In the case of any open cockpit plane with the tail sitting low, it is possible for water to collect inside the elevator push pull tube. This will rust away the elevator yoke and corrode the push pull tube also.

Even leaving the plane in the rain can allow moisture to collect in the elevator yoke. Please avoid the practice of spraying water into the cockpit area of your plane, open cockpit or not, this is a practice that will lead to corrosion problems and part replacement.

If you suspect your aircraft of corrosion problems, inspect all areas where water may collect, such as the elevator yoke area.

RIGGING THE S-4/5

SETTING THE AILERON

NOTE: All rigging operations require the aircraft completed to fully assembled ailerons/flaps.

1. Make a rigging jig as shown in **Figure CG-01**. Remember the rigging board that you made to set the bottom of the S-1? Find it and place it in the cockpit to hold the stick centered. See **Figure CG-01A**. Place the new jig on the under-side of the wing at mid-span of the aileron. The trailing edge of the aileron should touch the jig. Adjust so the play is out of the ailerons. To assure no play, tape the ailerons to the top of the wing. See **Figure CG-01**.

FIGURE CG-01

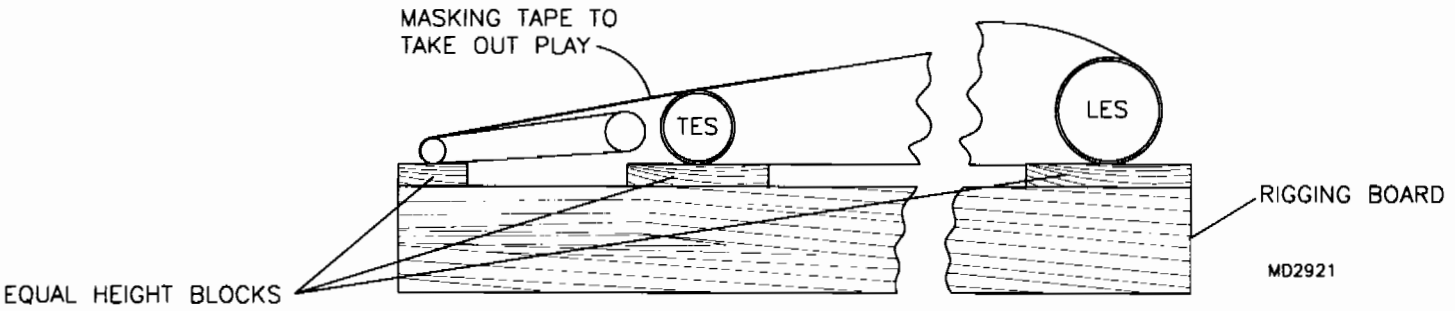
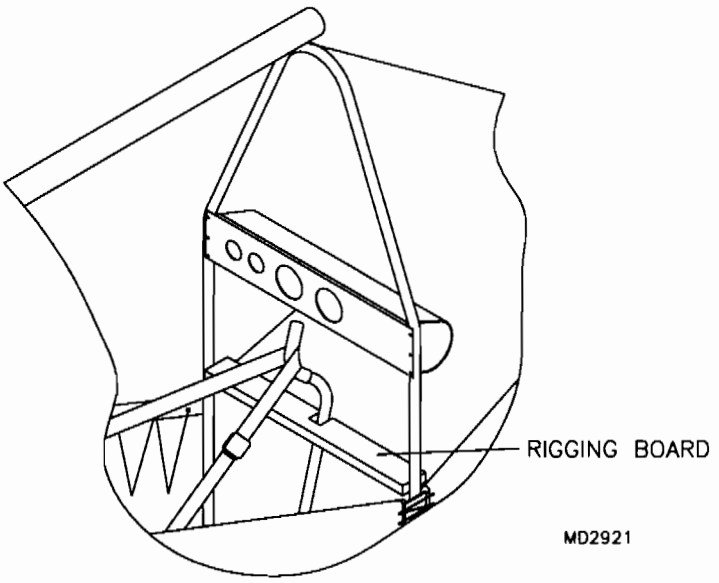


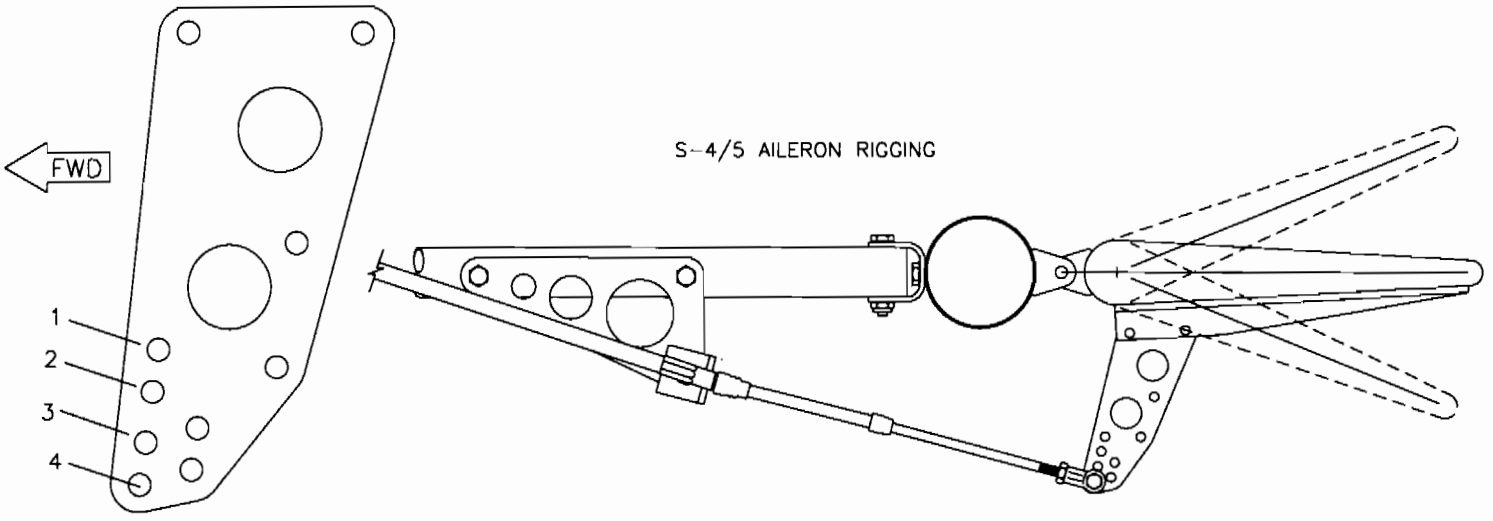
FIGURE CG-01A



2. Remove the tape from the ailerons and adjust the flaps to match the ailerons. **IMPORTANT:** When adjusting any rod end on the aileron, flaps, or elevator, make sure the rod end is at least 6 turns onto the shaft or I-nut.

3. The control pressure in a roll can be custom tailored to your liking. The aileron horn has 4 holes for adjusting. The lower the hole the lighter pressure-less roll, higher hole-more pressure, more roll. See **Figure CG-03**.

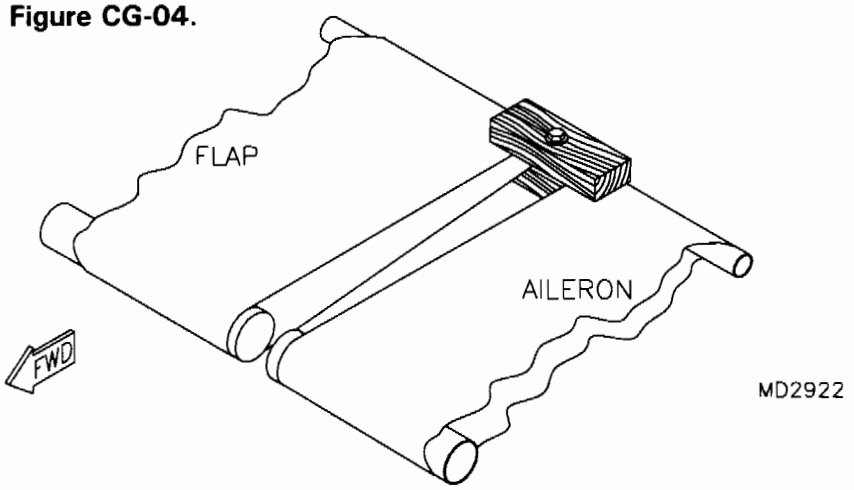
FIGURE CG-03



FOR GROUND ADJUSTABLE FLAPS

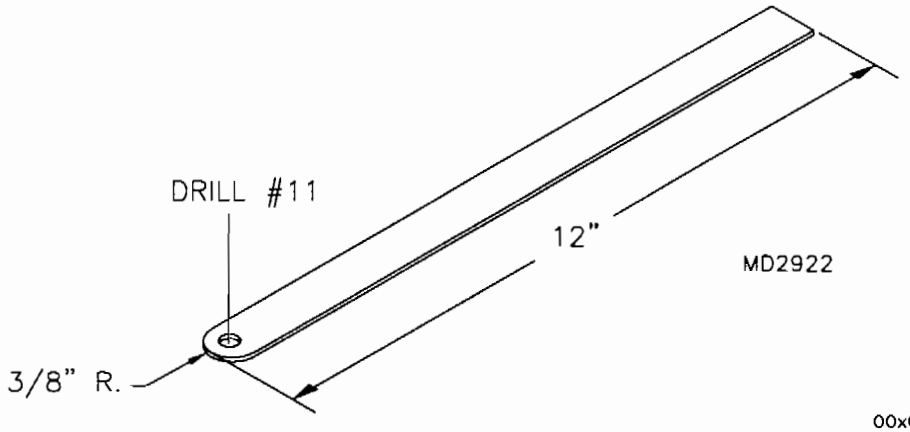
4. Place the ailerons in the neutral position. Fix the flaps even with each aileron using 2 blocks of wood and a bolt. See **Figure CG-04**.

FIGURE CG-04



5. Fabricate 2 straps from the 3/4" x .050 aluminum strip provided with your kit. See **Figure CG-05**.

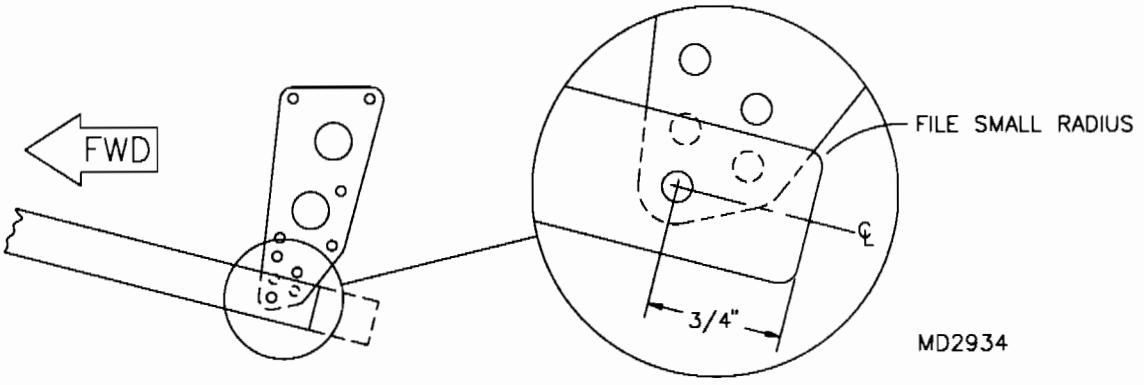
FIGURE CG-05



6. Hot knife a slot into the bottom of the wing where the strap will exit.

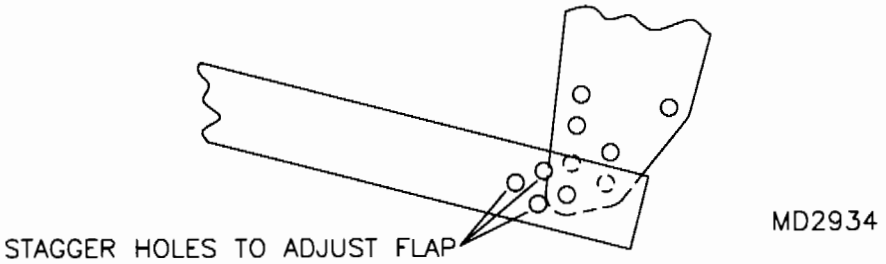
7. Bolt the drilled end of the strap to the wing compression tube. Place the un-drilled end of the strap over the lower hole on the flap horn. Center the strap over the hole and transfer drill through to #11. Trim as per **Figure CG-07** and bolt to the horn.

FIGURE CG-07



8. **RIGGING NOTE**: If during test flights, the plane rolls to the left or right it may be required to adjust the wing wash out or flap setting. Wing wash out adjusting is required if a wing drops in the stall. A flap adjustment is required if there is a roll tendency in level flight. Make the adjustments by drilling holes to raise or lower the flaps. See **Figure CG-08.**

FIGURE CG-08

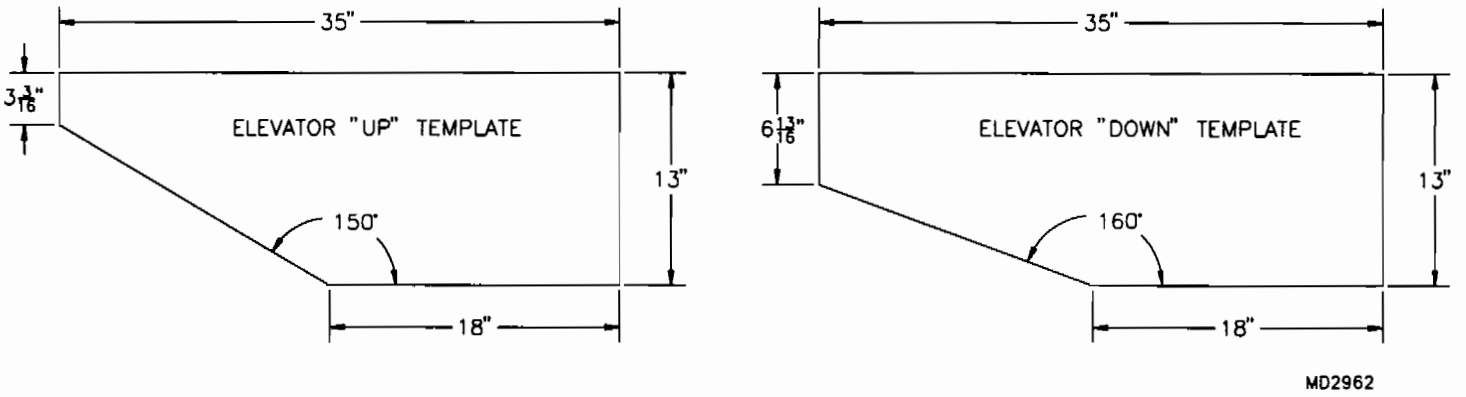


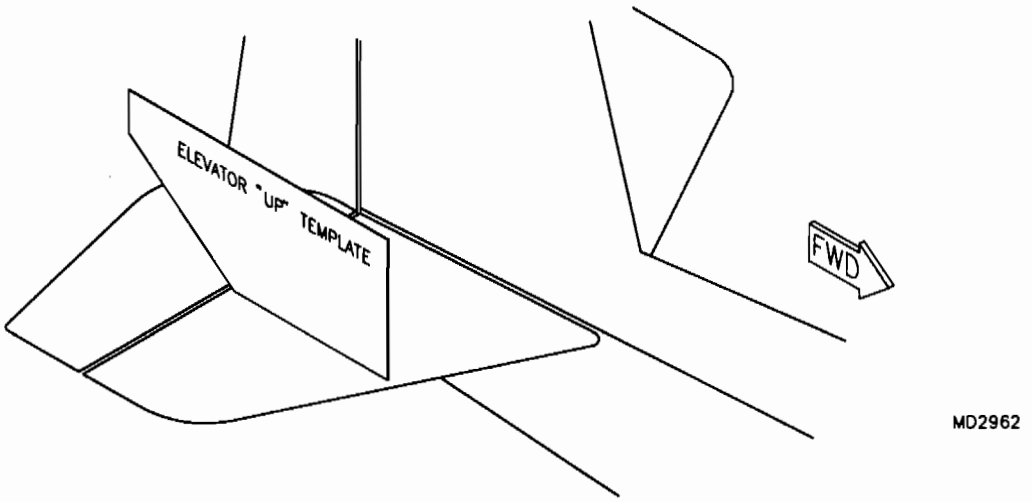
TAIL: ELEVATOR/STABILIZER/RUDDER/VERTICAL FIN

9. For 503 equipped planes, set up the horizontal stabilizer with the leading edge in the lowest hole on the bracket and the second lowest for the 447 engines.

10. The elevators should be adjusted to be level across each other. View from behind to check the line-up. Secure the control sticks in their neutral position. Adjust the male rod ends in the elevator yoke to set the elevators neutral. **IMPORTANT**: The rod ends must be turned into the yoke at least six full turns. The elevators will travel approximately twenty seven degrees up and twenty degrees down. Refer to **Figure CG-10** and fabricate the templates as shown. Use the templates to verify the travel of the elevators as shown.

FIGURE CG-10





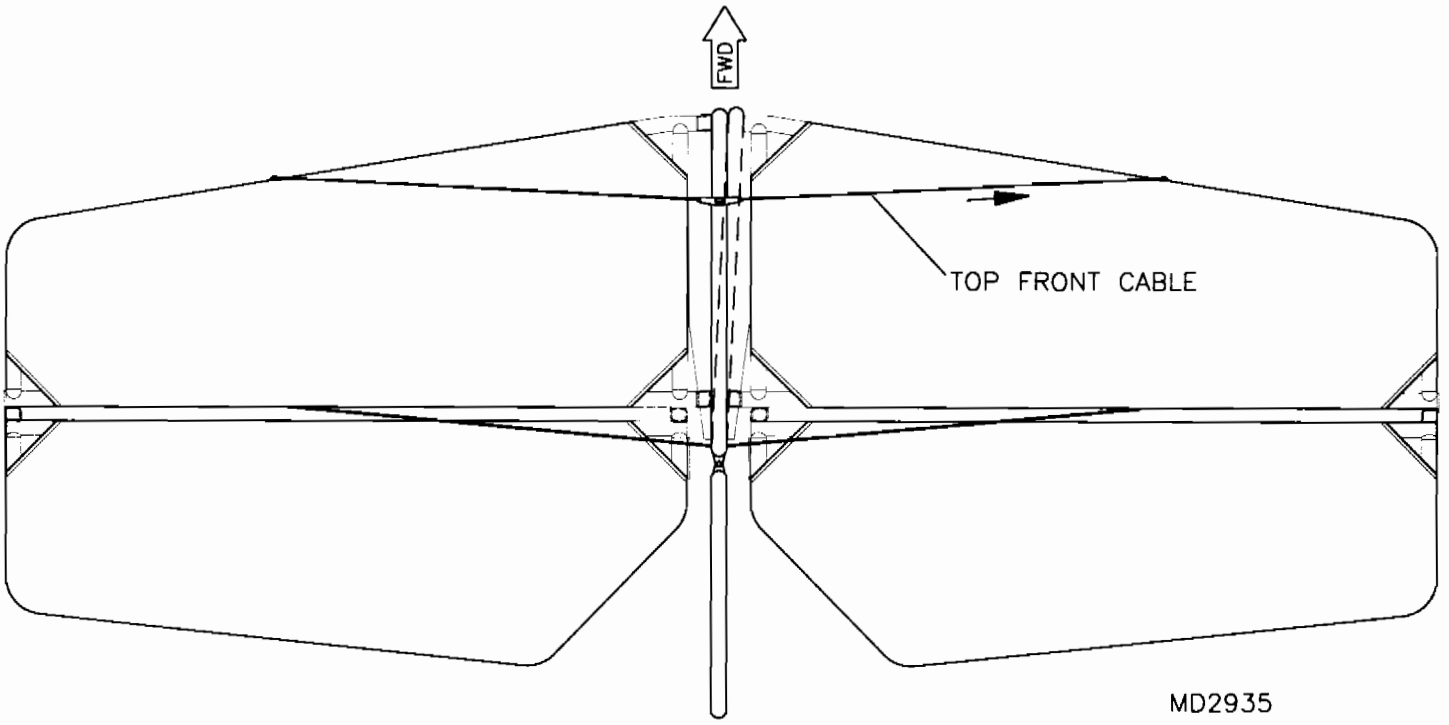
11. The rudder may or may not require a trim tab. Determine this during flight testing or see below.

◆ CORRECTING FOR YAW ◆

If during flight testing, the plane yaws left or right (with feet off the rudder pedals). It is possible to twist the vertical fin alignment slightly to effect the trim. This is done by adjusting the tail cables. For example, if the plane yaws left adjust the top front cables so the leading edge of the vertical fin is pulled to the left.

Flight check the setting. If more is required, the vertical fin spar can be pulled a little to the right. See **Figure CG-12**. A rudder trim tab can be used also if twisting is not enough.

FIGURE CG-12



◆ CORRECTING FOR ROLL ◆

If when releasing the control stick the plane rolls either left or right it can be due to un-even flap settings. Observe if the flap is lower on the side the plane rolls **away** from. Make adjustments as required.

Another source of roll can come from the wing twist. Confirm this by performing stalls. If the wing drops favoring one wing over several stalls, that wings needs an **increase** in twist. **NOTE:** Aileron/roll trim tabs should never be required as long as a flap adjustment can be made. In some cases, you may run out of adjustment on the flap or aileron teleflex. It is okay to cut off some of the threaded section on the teleflex (1/4") to gain adjustment. Also, the jam nuts are not required on the teleflexes since the rod ends are fixed to the horns.

◆ TRIMMING IN PITCH ◆

C.G. location and the angle of horizontal stabilizer incidence effects the pitch trim. Although your Coyote I comes equipped with an elevator trim tab, the trim power can be used up it the plane is nose heavy.

Performing an accurate weight and balance will tell if a nose or tail heavy condition exits. It is okay to fly anywhere within the C.G. range to test the trim system for its ability to trim out for:

1. Level cruise, 70 mph
2. Reduce stick forces with use of flaps,
3. Trim for shallow climb or descent

If your trim tab is not powerful enough for #1, it maybe required to increase the angle of incidence of the horizontal tail. If your horizontal tail is at the maximum incidence consider these options:

1. Adding a fixed trim tab to the elevator,
2. Adding ballast or moving the battery (if applicable) to effect a more middle range C.G.

◆ SUMMARY ◆

With all axis in trim the S-4/5 should be able to:

1. Trim out in level flight between 60 and 70 mph,
2. Climb and descend by adding and reducing power from level trimmed flight,
3. Hold a heading with only rudder input,
4. Recover from a dive with neutral trim (a fixed tab may be required with 503's), and
5. Fly for 15 seconds with hands and feet off before banking right.

If your machine passes all five, it will be a pleasant true flyer. Happy landings!

AIRCRAFT COVERING SAFETY TIPS FOR DACRON SKINS

Safety is a personal responsibility. You, as the owner, operator, and chief pilot, are responsible for the airworthiness of your aircraft. Ultimately you control the life and monitor the level of safety through pre-flight inspections. During pre-flight check for the following:

A. Fabric rot.
B. Thread wear and broken stitches. Open ends lead to premature seam separation.
C. Chafing and hanger rash.
D. Fading.

Watch your fabric for signs of fading. The number one sign of ultraviolet damage is a lightening in the color of the fabric. The Dacron used to cover your aircraft was originally designed for sailboats. Sailors typically stow away their sails after a hard days sailing. Extend your fabric life by using a field storage cover or a hanger.

Life expectancy varies with latitude. The closer to the equator you are, the more intense UV rays get. Also, there are indications that due to environmental factors, like ozone depletion, the amount of solar radiation penetrating the atmosphere is increasing. A conservative estimate on the life span of untreated 3.9 Dacron is 350 exposure hours. Controlled exposure can extend life of untreated sailcloth to 10 years.

Coatings can help extend useful life. Clear Imron can double the life of a covering. The disadvantage of this type of process is that the skins become a permanent part of the aircraft. Should a skin need removing for repairs, etc. the coatings may crack and peel giving you a molting snake skin effect.

As mentioned earlier, storage methods can increase life. Tarps and fitted covers are recommended for outside storage. If available, shade hangers are better and fully enclosed hangers are best.

Extend the life of good fabric by making repairs.

A. Check for growth of minor rash and pin holes.
B. For small cuts or holes 2" or less, sew with a baseball stitch then apply sail tape or a glue patch.
C. Medium sized cuts or holes 2" to 6" can be repaired by applying an adhesive patch and hand stitching.
D. Large rips and holes and/or blown out panels 6" or larger should be examined by a professional repair service.

TESTING FABRIC

A. **FADE FACTOR:** Compare the top and bottom surfaces of your wing. Top surfaces of a considerably lighter shade are a cause for concern.

B. **FINGER POKE TEST:** Poke the top surface of your wing. A finger poke will not go through good fabric.

C. **FABRIC TESTER:** This involves standardized testing with a calibrated scale.
MAX: The maximum value for new fabric is 25#.
MIN: The minimum safe values are 12# or 15# depending on surface tested.

CHECKING STATIC RPM

Prior to the first flight, determine the engine's static RPM; this is the speed it develops when stationary and fully throttled. An acceptable static RPM indicates that the engine is operating at or near full potential and should not over-speed during the first flight.

First, calibrate the engine tachometer to make certain it's accurate. Determine the propeller's RPM with a *light tach* (a hand-held device which measures propeller rotation with infrared pulses) and compare the reading to the tachometer's, taking into account the engine's gear reduction ratio. The tachometer supplied with your RANS kit is equipped with a calibration knob; refer to the manufacturer's instructions.

Once satisfied with the tachometer, run the engine with the throttle fully open; be certain the tail is tied down and the main gear is chocked. For the two-stroke Rotax 503 and 582, acceptable static RPM is usually about 6000 to 6200; for the four-stroke 912, it's usually 5000 to 5200. (A number of factors influence this, including the number of propeller blades, their length and pitch.) Ideal static RPM would render an *in-flight* RPM just below red line with the throttle fully open at sea level.

A high static RPM may indicate that the propeller is pitched too finely (the blades take too small a bite of air). This prevents the propeller from performing most efficiently and may allow the engine speed to exceed red line in flight. If the blades are adjustable, increase pitch; refer to the manufacturer's instructions. If the blades are fixed, contact the manufacturer.

A low static RPM may indicate that the propeller is pitched too coarsely (the blades take too large a bite). This also prevents the propeller from performing most efficiently and induces excessive load on the engine. If the blades are adjustable, decrease pitch; if fixed, contact the manufacturer. If finer pitch does not raise maximum engine speed to an acceptable RPM, another problem may be indicated.

WARNING: Attempting flight with too much or too little propeller pitch may have severe consequences. Conduct flights only with sufficient power output!

Knowing the ideal static RPM allows you to check the health of the engine during a full-throttle run-up prior to takeoff. Once you've become familiar with the in-flight performance of the engine and have adjusted the propeller, you'll know better what the tachometer should indicate during run-up.

CREATING A PILOT OPERATING HANDBOOK

Most pilots are accustomed to flying light planes with comprehensive pilot operating handbooks. This is a result of the standardization required by FAA certification, the fruit of which is fleets of identical aircraft for which specific checklists, procedures and performance figures may be published.

This section includes much information on the operation, limitations and performance of RANS aircraft; however, the nature of kit-built aircraft makes it impossible to publish *specific* checklists and procedures applicable to *all* examples of a particular model. This is because the builder, as manufacturer of the aircraft, has the freedom to assemble, equip and modify his machine as he wishes. The result is fleets of aircraft that share the same name and designation, but vary somewhat in operation and performance.

The builder should consider carefully all aspects of the engine, airframe and equipment when developing checklists and procedures for his plane. For example, he might begin the preflight inspection by opening the cabin and checking that the magnetos are off; this would ensure the engine cannot start if the propeller were moved. With the cabin open, he also might drain fuel from the sump, allowing any water trapped in the system to escape. He then might begin a walk-around, moving about the ship in a logical, straightforward manner, checking the presence, security and condition of hardware and components.

With the walk-around completed, he might seat himself in the aircraft and consider the checks necessary for a safe and mechanically sound engine start. This will depend largely on the specifics of the engine, fuel, ignition and electrical systems he has installed. Again, a straightforward, logically-flowing checklist should be developed that addresses the particulars of his machine.

The same care should go into development of a pre-takeoff checklist. Of particular importance is a proper engine run-up to check the health of the power plant. An essential checklist item often given short shrift is that of free and correct movement of control surfaces; this is particularly important for aircraft that fold or disassemble.

Considerable forethought should be given to potential emergencies. What steps should be taken to deal with balked landings, engine failures or fires? How might these steps vary according to the phase and conditions of flight? Consideration of contingencies now is likely to mean faster, more appropriate reaction to urgent or emergency situations, should they arise.

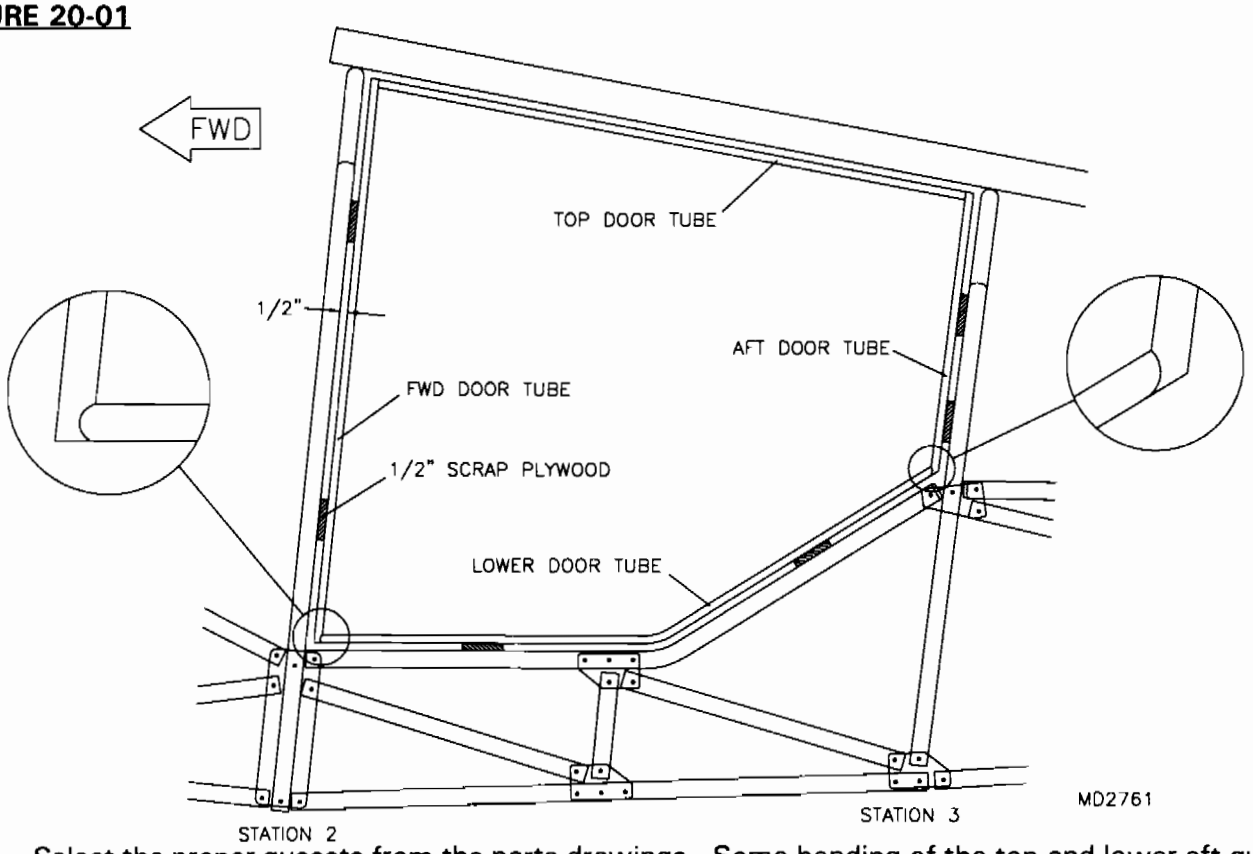
Since each kit-built aircraft is unique, each builder should expect his aircraft's performance to be unique. The prudent builder will determine carefully the weight and balance parameters of his plane before its first flight. He'll familiarize himself with its flying characteristics during the flight test phase, cautiously exploring its capabilities and limitations while heeding the designer's words of advice. The U. S. Government, the Experimental Aircraft Association and other publishers offer a wealth of information on flight preparation and testing. As a first step, the builder might refer to the FAA's AC-90-89, "Amateur-Built Aircraft Flight Testing Handbook."

By applying suitable checklists and procedures to his plane and operating it within reasonable limits, the builder helps ensure his safety as well as the reliability and longevity of his airframe, power plant and components.

DOOR ASSEMBLY

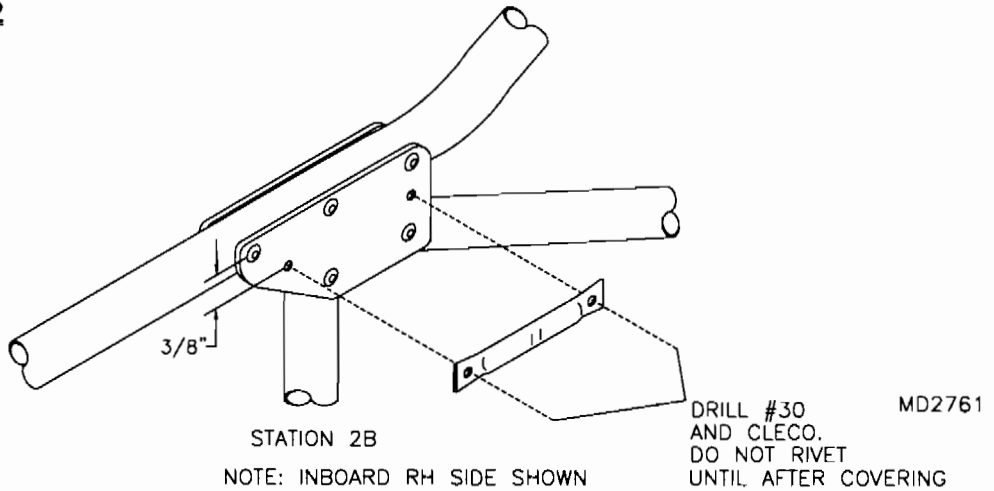
1. To assemble the doors, use the fuselage as the jig. Keep ½" spacing between the door tubes, S-2, S-3, and 2-3. Tape scrap ½" plywood pieces to the S-2, S-3, 2-3. Tape the fwd, aft, and lower door frame tubes onto the plywood keeping the ½" door tubes flush with the outboard edge of 1" tubes. The bends in the door tubes should match fairly close to the bends of the fuselage. Trim the top and bottom door tubes to fit between the fwd and aft door tubes. See **Figure 20-01**.

FIGURE 20-01



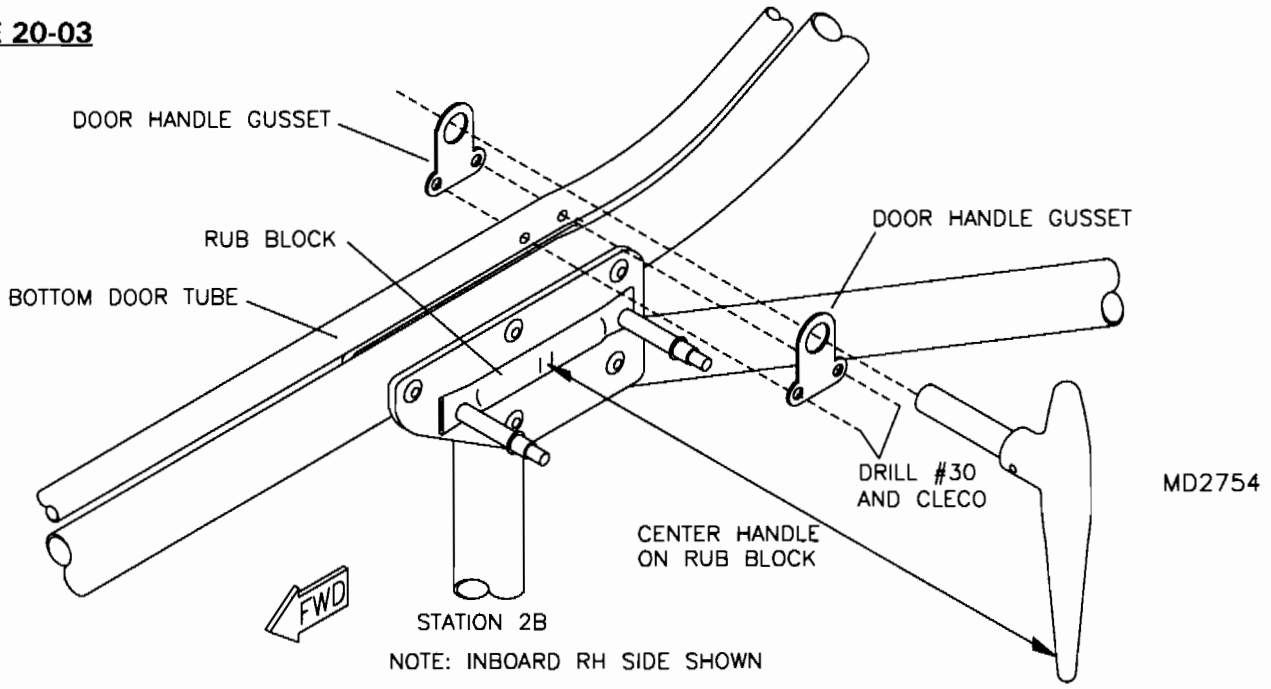
2. Select the proper gussets from the parts drawings. Some bending of the top and lower aft gussets are needed to fit the curve of tubes. Starting with the outboard side, hold the gusset in place mark where the curve is needed and shape over 1" tube. While keeping the gusset centered on the high point of the tube, drill and cleco the outboard gussets in place. Drill and cleco the inboard gussets in the same manner. Locate, drill and cleco the rub block to the inboard G-5 gusset on 2-3. See **Figure 20-02**. **DO NOT** rivet the rub block in place till after covering.

FIGURE 20-02



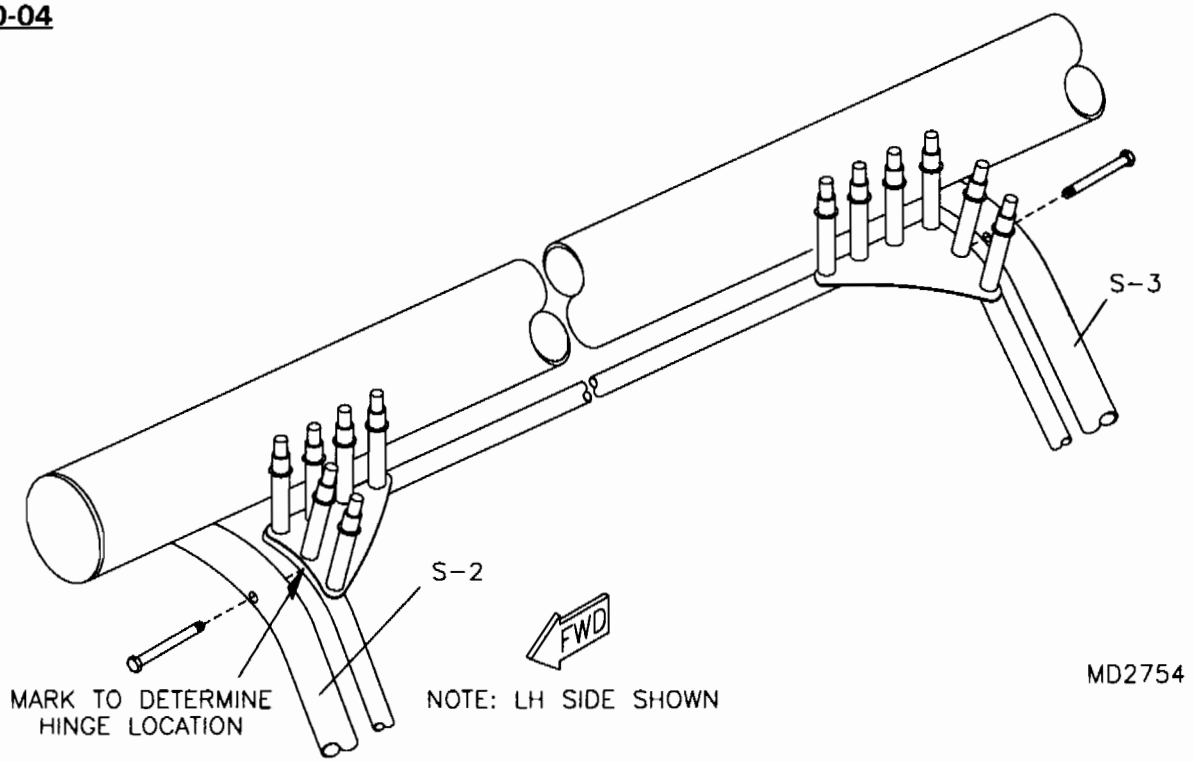
3. Locate, drill and cleco the door handle gusset to the door frame so the inboard door handle hangs down centered on the rub block. Install a AN3-16A bolt into the hinge points on S-2 and S-3. Be sure to note the proper direction of the bolts. See **Figure 20-03**.

FIGURE 20-03



4. Mark the fwd and aft door tubes upper curve where the center of the bolt contacts. This mark determines the location of the hinge on the door frame. This mark should be approximately 7/8" from the end of the tube. See **Figure 20-04**.

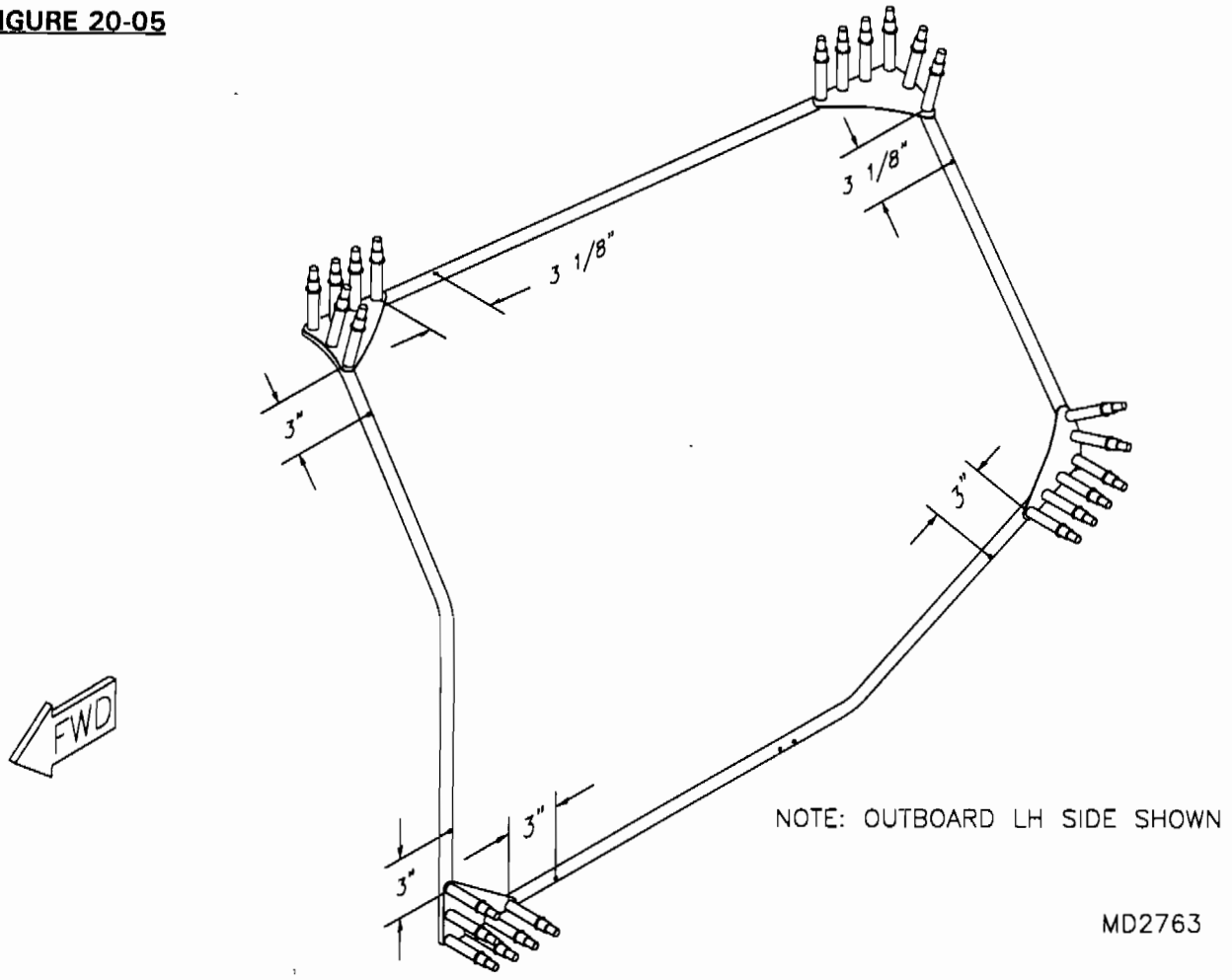
FIGURE 20-04



5. Locate and drill holes in the door frame tubes. For the lexan space as follows: See **Figure 20-05.** Hole spacing begins on the last hole of each gusset. Work from each end on the bottom tubes meeting at the bend. Remove the door frame from the fuselage.

Top Tube	3 1/8"	Bottom	3"
Aft	3 1/8"	Fwd	3"

FIGURE 20-05



6. Remove, debur and rivet the inboard gussets. Do not rivet the exterior gussets at this time.

7. Rivet the nut plates to the hinge plates. Locate, drill and cleco the hinge plate onto the door frame. These nut plates should rest tight against the door frame. The center of nut plate needs to be in line with the mark made on the frame with the hinge bolt. Debur and rivet with CCPQ-42 rivets.

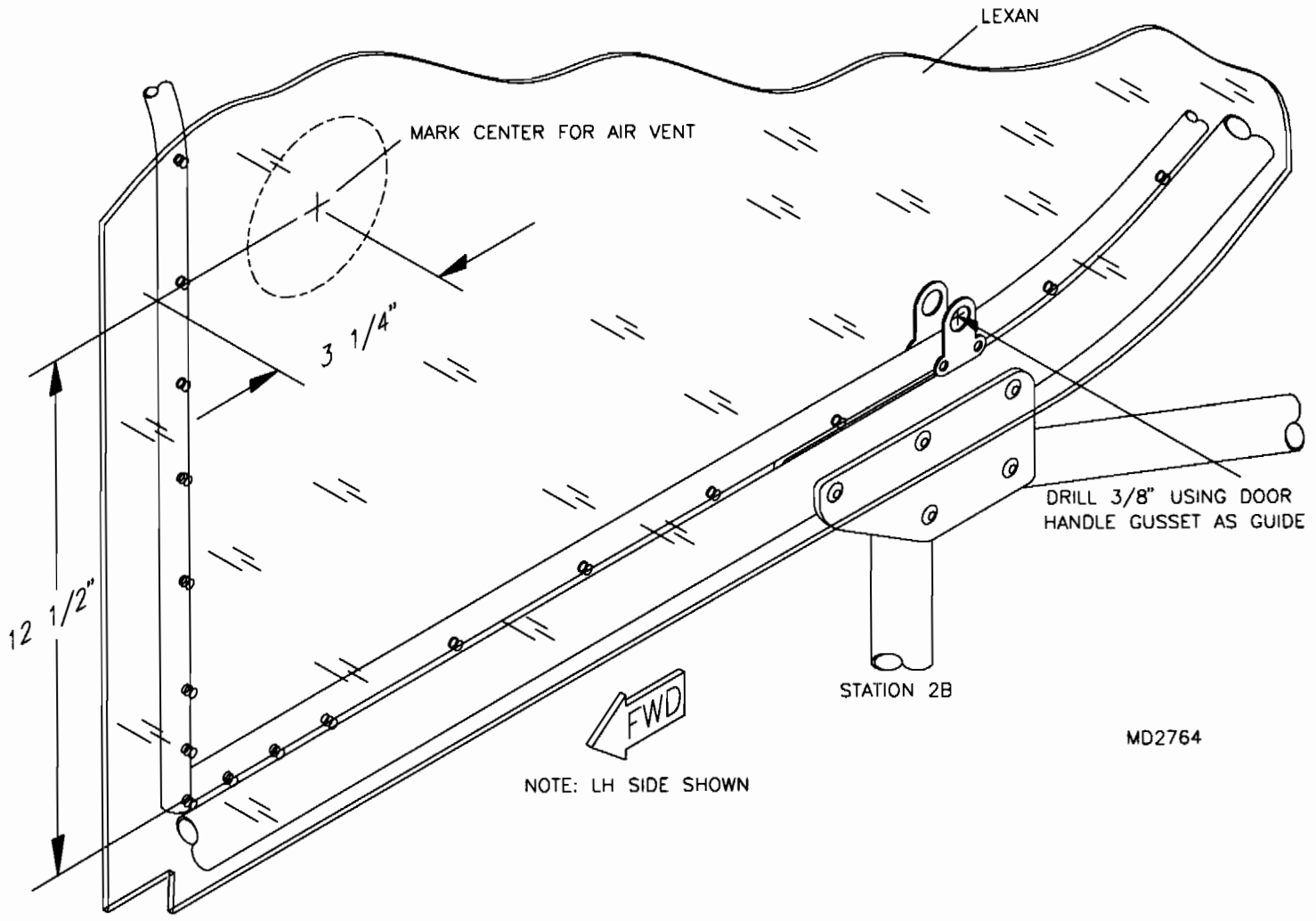
8. Install the door frame on the fuselage with hinge bolts and bushings. Remove outboard gussets and debur all the holes. Position the door lexan onto the door frame. Keep the top side flush with the top of the frame; aft edge of lexan even with the aft edge of S-3; fwd edge should overlap the windshield. Tape or clamp the top edge of lexan to top of frame.

Using the door frame as a guide, mark the inside protective covering on the lexan with a marker. Remove the lexan and then peel off the inside covering where marked. Then remove the outside covering to match the inside. **NOTE**: Avoid removing too much protective material to avoid scratching the lexan during assembly. Tape or clamp the lexan onto the door frame top tube and allow the lexan to hang down.

9. Starting with the top tube and using the holes in the tubes as a guide, drill the lexan and cleco to the frame. Work from the center outward making sure the lexan does not move or buckle. Work down on the fwd and aft tubes then across the bottom. Be sure to drill all the holes including the gusset holes.

10. Using the edge of the windshield, aft edge of S-3, and lower edge of 2-3 as a guide, apply masking tape to the door lexan. Excess lexan will be trimmed at the edge of the tape so the door and windshield lexan meet flush and the aft and lower edge of door lexan are even with the far edge of the 1" tubes. Also, mark the lexan where it contacts any bolts on S-2 and S-3, these areas will be trimmed so lexan does not rest on the bolt head. Drill a 3/8" hole in the lexan using the outboard door gusset as guide. See **Figure 20-10**. Locate center of hole for the air vent.

FIGURE 20-10

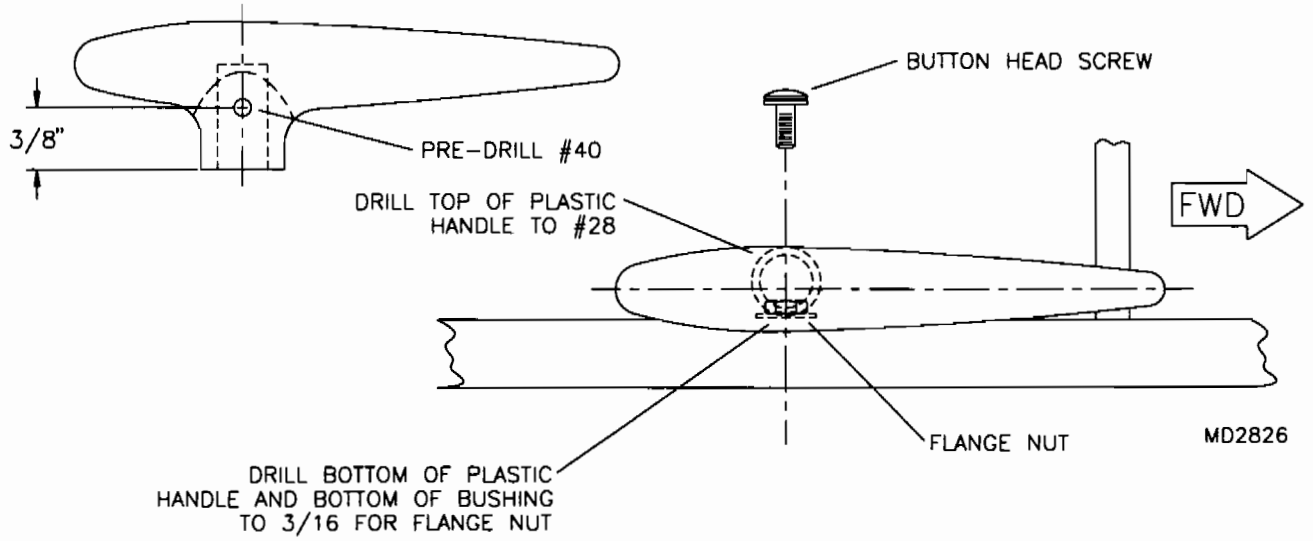


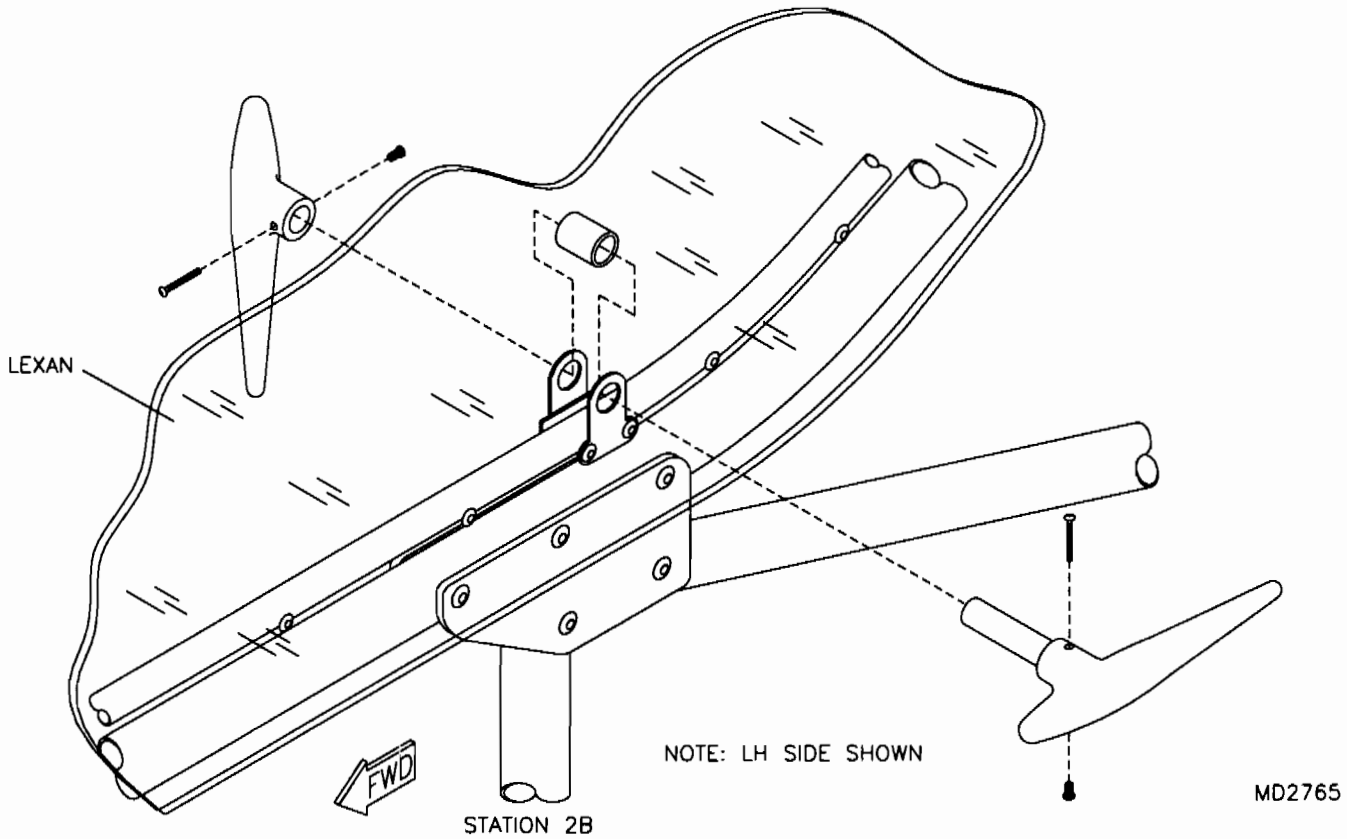
11. Remove lexan, drill holes in lexan oversized to #28 and debur. Trim lexan and smooth edges. Drill a 3 1/4" hole for the air vent and debur.

12. Cleco lexan onto the door frame. Install ½" of the top gap seal between the lexan and frame. Keep the seal straight with the tube. The gap seal is longer than the frame, keep ends of seal with equal overhang. The velcro seam will meet under the keel from each side. Starting at the top rivet the lexan to the frame with outboard gussets on top of the lexan.

13. Refer to the parts drawing and **Figure 20-13** to assemble the door handles. Door opener support brackets will be attached to the door frame after final wing installation so there is clearance between the lexan and wing.

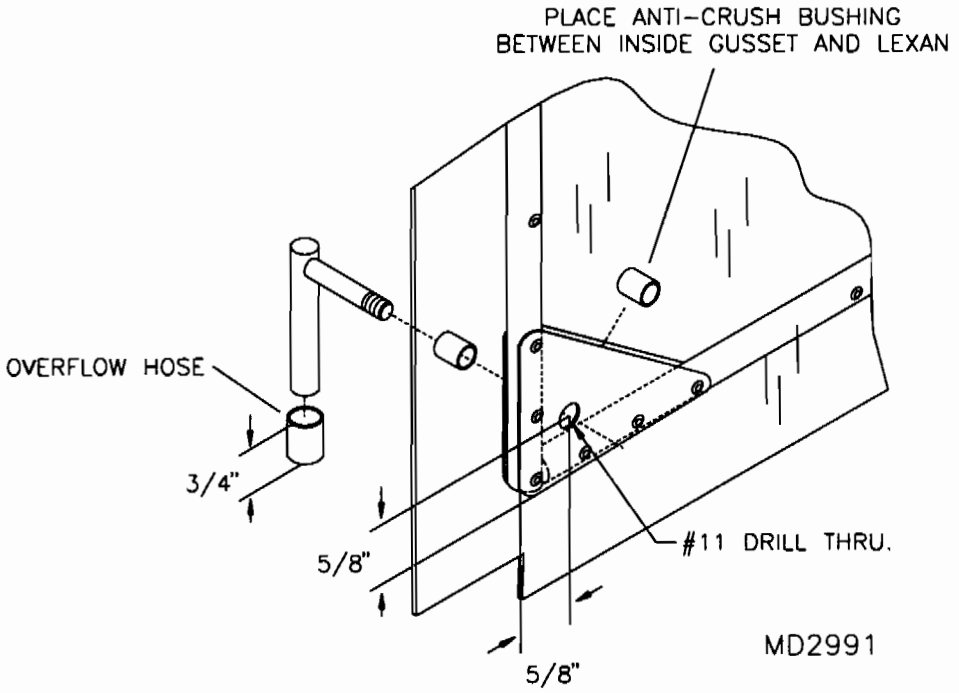
FIGURE 20-13





14. Cut a small segment of overflow hose and slip over the end of the door latch-fwd. Locate and drill a #11 hole as per **Figure 20-14** through the lower forward door gussets. Cut two 1/2" bushings and assemble the door latch-fwd as per the parts drawing.

FIGURE 20-14



15. When completed with the door assembly attach a 10" strip of 1" black foam tape to the bottom of each wing where the door and wing contact.

OPTIONAL DUAL FUEL TANK ASSEMBLY

For the assembly of your optional wing tank, refer to the previous sections and assemble in the same manner as was done with the standard tank.

OPTIONAL FLAP LEVER ASSEMBLY

1. Using a tube cutter fabricate the following bushings in the appropriate lengths:

Qty.	Length	Tube Size
2	7/8"	1/4" X .028
2	3/4"	1/4" X .028
2	11/16"	1/4" X .028

2. Press the plastic caps into each end of the 3/4" flap trip release tube.

3 . Screw on the rod end to the teleflex cable. Bolt on the teleflex and cable clamp as per the parts drawing using the 11/16" bushings. Include the bracket under the upper AN3-14A bolt, this will be used to stabilize the flap lever assembly against the airframe.

4. Bolt on the flap lever between the two side plates with the welded tab facing down. Tighten the flap lever bolt so it is snug, but still allows the lever to pivot freely. Slip the spring into the flap lever tube and slide in the flap trip release tube.

5. Turn and depress the flap trip release tube until the 1/4" hole is lined up with the slot. Install the bolt and bushings into the flap lever. The bushings act as rollers and will ride against the flap lever sides. Tighten the bolt to the point the bushings still roll. Apply a light grease to the rollers for the best action. Test operate the lever by pulling up on the lever, then depressing the flap release tube return.

6. Bolt the rod end to the right side of the welded tab on the flap lever. The exact adjustment of the rod end on the teleflex will be determined when adjusting the flaps. To properly rig the flaps, all three teleflex cables may require adjustment. It may also be required to trim off the ends of the teleflex cables where they attach to the horns. This will be apparent during rigging.

7. Install the flap lever assembly into the cockpit by slipping on two 3/4" bushing over the bolts on the airframe. Insert the 7/8" bushings between the flap lever side plates. Install the nuts and washers and tighten but do not smash the tubes.

8. The bracket bolted to the rear end of the flap lever assembly rivets with a 3/16" stainless steel rivet to the nearest diagonal tube. Bend the bracket to line up on center of the tube, drill and rivet.

9. Install the dual teleflex retainer to the end of the teleflex cable. Route the teleflex cable to the top of the keel and insert into the single teleflex retainer. Safety wire the teleflex to the retainer.

10. On the end of the flap teleflex, install a 3/16" tensile nut. Tighten this nut so there is enough gap to slip into the slot on the dual teleflex retainer. After the wings are installed, hook up each flap teleflex cable to the retainer on the keel. Use the clips to retain these teleflex cables.

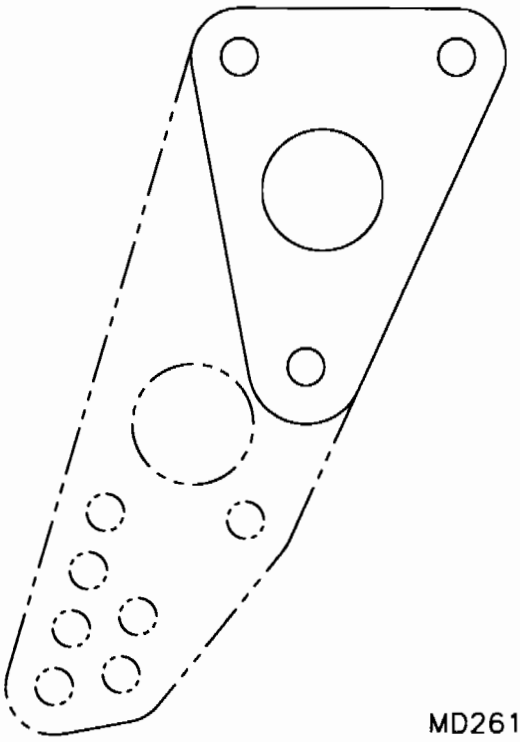
11. After final assembly, adjust the flap through the rod ends and tensile nuts. Both flaps should be even when viewed from the front or aft center. During flight testing, look for a rolling tendency if flaps are not flying even. In some cases the flaps may end up slightly uneven to get the plane to fly level.

INSTALLING THE OPTIONAL IN-FLIGHT FLAPS

1. For flap covering, complete the instructions in the Flaps & Aileron section.

2. For in-flight adjustable flaps, the flap horn will need to be trimmed. Use **Figure 20B-02** as a template for trimming. **HINT:** A band saw works nicely for this. File smooth any rough edges.

FIGURE 20B-02



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3. Attach the elevator horn to the compression tube within the wing as per the parts drawing.

4. Slide the teleflex cable through the wing placing it on top of the compression tubes. Do not tie or attach the teleflex cable to the compression tubes in any manner. The cable needs to be able to move freely.

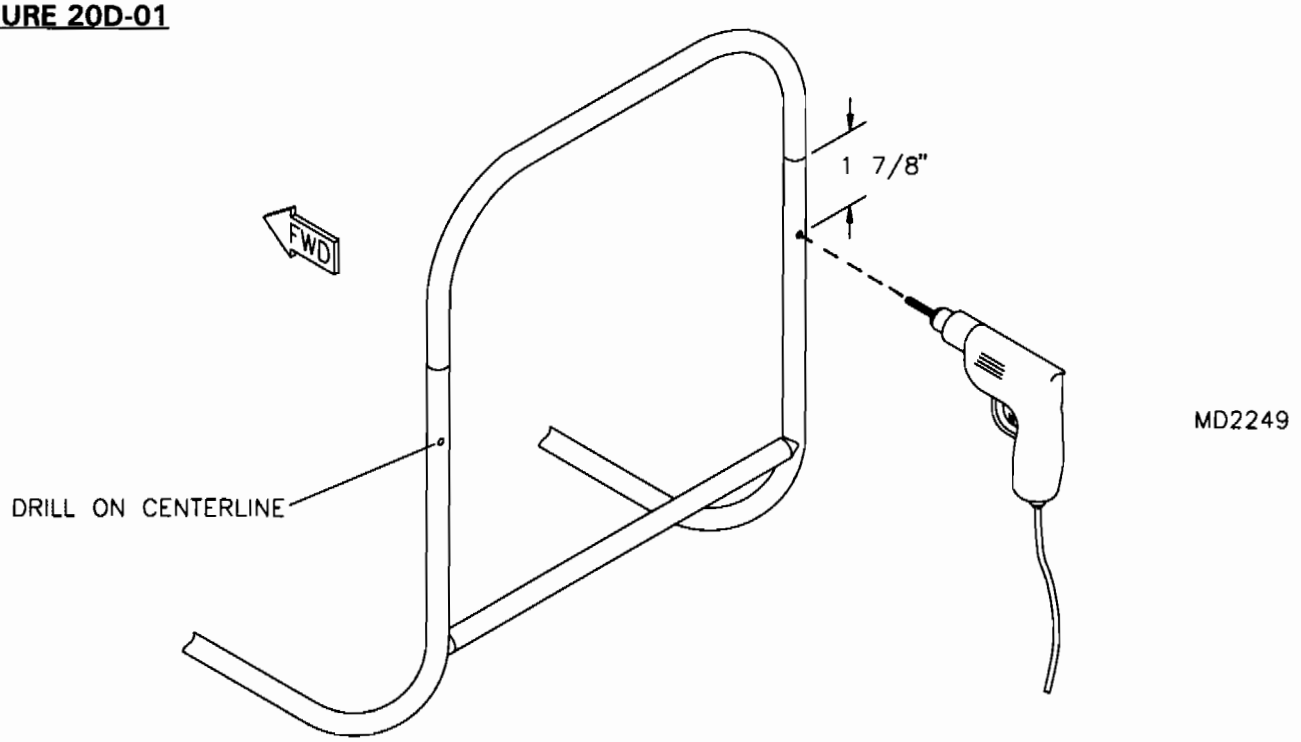
5. Install the teleflex retainer bracket and teleflex cable to the elevator horn as shown in the parts drawing.

6. Install the rod end on the cable and attach it to the flap horn as shown in the parts drawing. **NOTE:** It is important that you install the rod end a minimum of 6 turns on the cable. Loosely tighten the nut as this time. Adjustments will be made later. Next attach the teleflex cable to the retainer on the keel.

OPTIONAL HEADREST ASSEMBLY

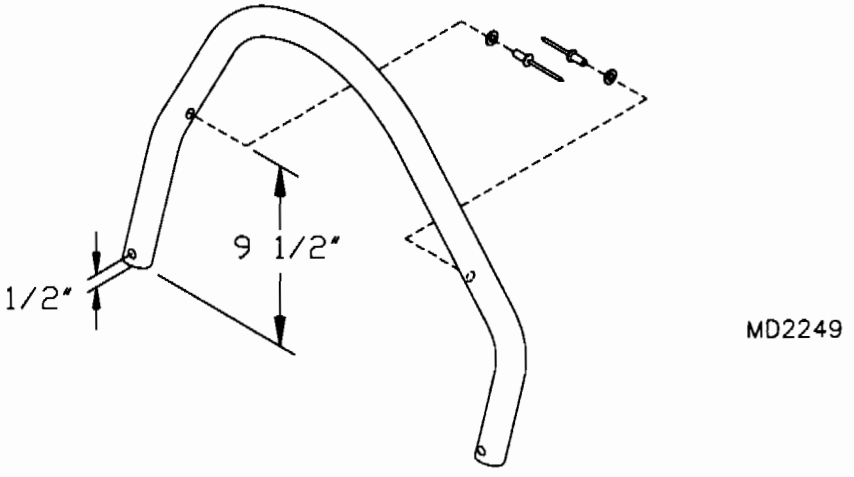
1. Drill a 1/4" hole on the back side of the seat frame as shown in **Figure 20D-01.** Do not drill through the forward side of the frame; only drill through the aft side. Install the 3/16" rivet nuts.

FIGURE 20D-01



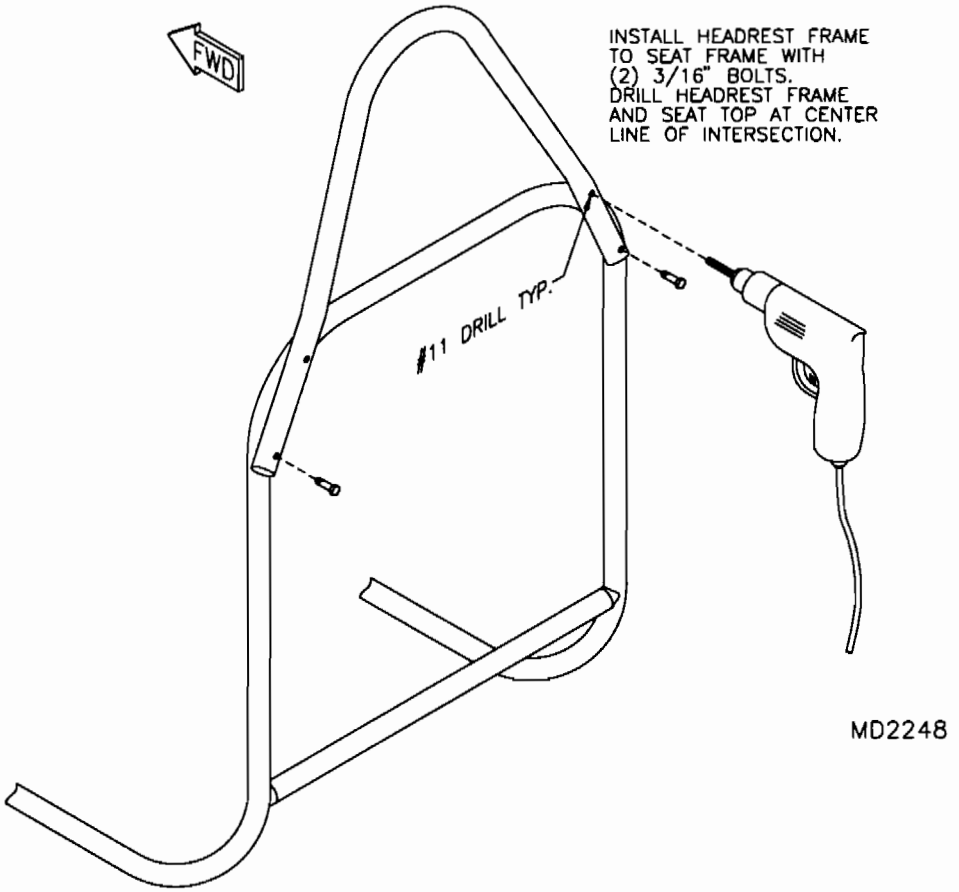
2. Drill the headrest frame as shown in **Figure 20D-02.** The holes should be 1/2" from the bottom edge of the tube and go completely through the tube. Also, locate the 3/16" button holes 9 1/2" from the bottom edge of headrest frame. Locate the button holes on the inside of the frame as shown in **Figure 20D-02.** Complete the button installation by installing the washers and rivets shown on the parts page.

FIGURE 20D-02



3. Bolt the headrest frame to the seat frame using the two rivet nuts already installed. Drill the headrest frame and the seat top tube where the center of the tubes intersect. See **Figure 20D-03.** Drill only through the aft side of the seat top tube. Remove the headrest frame and install the remaining two rivet nuts into the seat top tube. Re-install headrest frame.

FIGURE 20D-03



4. Snap the headrest internal brace into place between the buttons on the headrest frame. Slip the headrest cover into position. Route end of fabric around the bottom of the internal brace and back up to the velcro on the back side of the headrest cover.

5. Install the 1" end cap shown on the parts list. Drill #40 holes through the headrest frame and into the end cap. Install the rivets shown on the parts list to retain the end cap.

OPTIONAL 503 DUAL CARBURETOR ASSEMBLY

For assembly instructions of the 503 dual carb, refer back to the engine section.

OPTIONAL 9" SPINNER ASSEMBLY

1. The spinner and backing plate come ready to trim and drill. Observe the scribe lines and trim to these lines. Be especially careful to trim and sand the edges evenly. Check for trueness by setting on a flat surface. Drill the backing plate's center with a 1" hole saw. It may need a little sanding to fit over the prop flange. Test fit as you go. Wet sand with 350 grit paper.

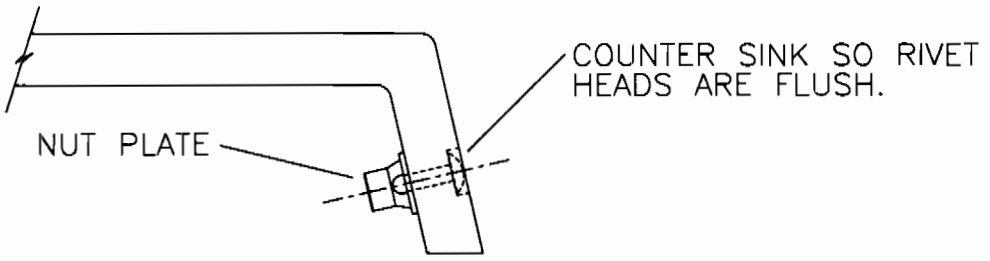
2. Insert the 1" aluminum tube scrap into the prop then install on the backing plate. Prop **MUST** be flat against the plate. Drill (6) 1/4" holes through the backing plate using the prop as a drill guide. **IMPORTANT:** After drilling the first hole, insert a 1/4" bolt to prevent shifting. **NOTE:** The slight dip in the plate is used to "pre-load" the plate against the prop.

3. Set the prop and backing plate on a flat surface. **NOTE:** To assure accuracy, bolt the backing plate to the prop with (3) bolts. (AN4-32A will work if washers are used.)

4. Set the spinner on the prop/backing plate assembly. Set it so an even amount of space is on either side of the prop openings. Mark the hole locations on the spinner's perimeter every 3" with (4) screws evenly spaced on each side. Drill through at these locations with a #30 bit, cleco as you go. Be sure the spinner and backing plate are flat against the table.

5. Disassemble and drill out the #30 holes to #11. Install the nut plates using a bolt to hold the nut plate in place and drilling from the inside. The rivet heads need to be "counter sunk", do so by drilling a slight depression with a #11 bit. See **Figure 20F-05**. After drilling the rivets, set them by resting the head against a vise and tapping the other end with a small hammer and check for tightness. The nut plates must be snug.

FIGURE 20F-05



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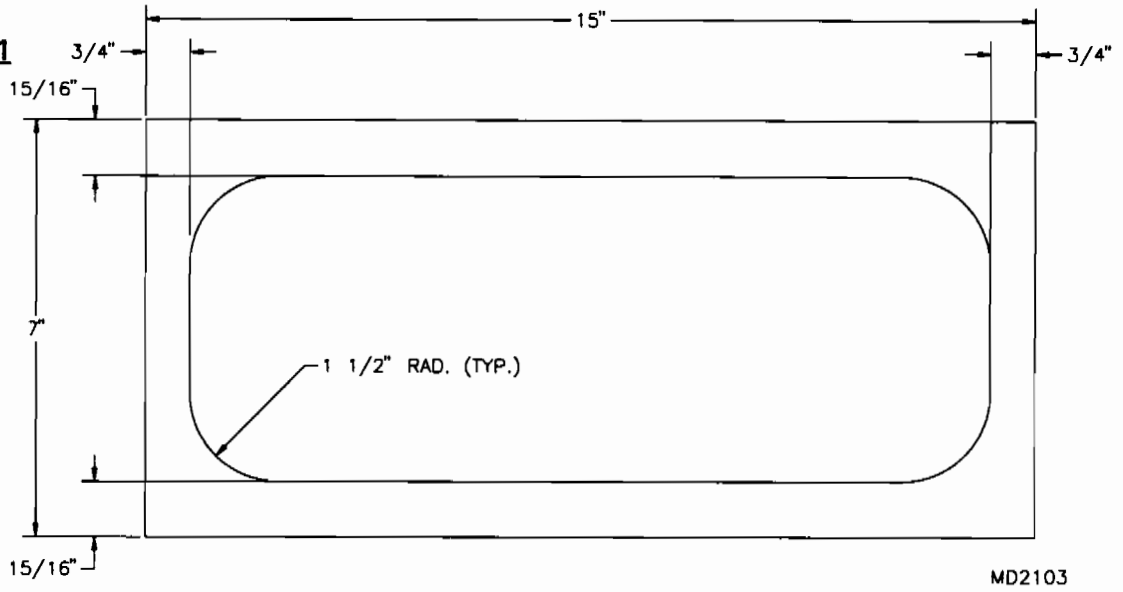
6. Sand the spinner with 350 wet/dry paper. Paint to match aircraft.

7. The spinner and prop should be balanced and no adjustment required. However, the ultimate test is in the running. If you have a lot of vibration it could be caused by out of balance or misalignment. Use a good prop balancer such as the one LEAF sells. (Available through LEAF or RANS). Check both the prop and the backing plate, if the misalignment is not correctable then a new spinner may be required. Misalignment occurs through improper trimming of the parts. A slight amount of "wobble" is acceptable and may disappear at higher RPM's.

S-4/5 OPTIONAL MAIN WHEEL PANT INSTALLATION

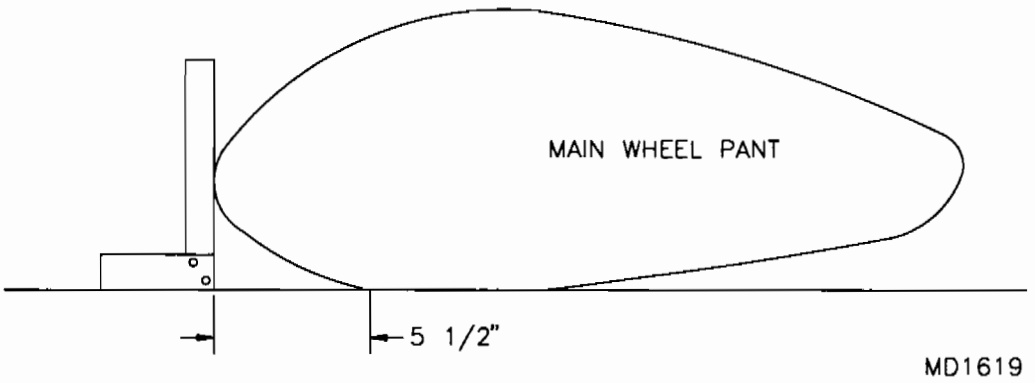
1. Fabricate the illustrated template shown in **Figure 20G-01** below from a piece of cardboard or poster board.

FIGURE 20G-01



2. Locate the bottom hole 5 ½" AFT of the tip of the wheel pant as shown in **Figure 20G-02**. **Do not** use the dimple molded into the wheel pant.

FIGURE 20G-02



3. Fabricate a cardboard template as shown below. Use this template to mark the brake cut outs. See **Figure 20G-03**. Look closely at the side of the wheel pant. A small X on the dimple marks the location of the proper axle location through the wheel pant. If your wheel pants are not marked or the X on the dimple is not visible, locate the template on the inside of the wheel pant flush with the bottom at 12 1/4" AFT of the tip hole center. See **Figure 20G-03A**. Mark around the outside of the template on the outside of the part and cut this section out. Place the template on the outside of the wheel pant in the same location on the opposite side and drill a #11 hole through the hole in the template. If your wheel pant is marked with the X on the dimple, you will need only to drill through #11 at that location for the outside axle location. **PLEASE NOTE:** It is sometimes necessary to locate the #11 hole ½" down from the small X on the dimple to allow for proper tire clearance in the top of the wheel pant. Please check for proper tire clearance before locating this hole. This may also affect the inboard side cut out. It is best to leave extra material through the radius area until proper clearance is reached, then trim accordingly.

FIGURE 20G-03

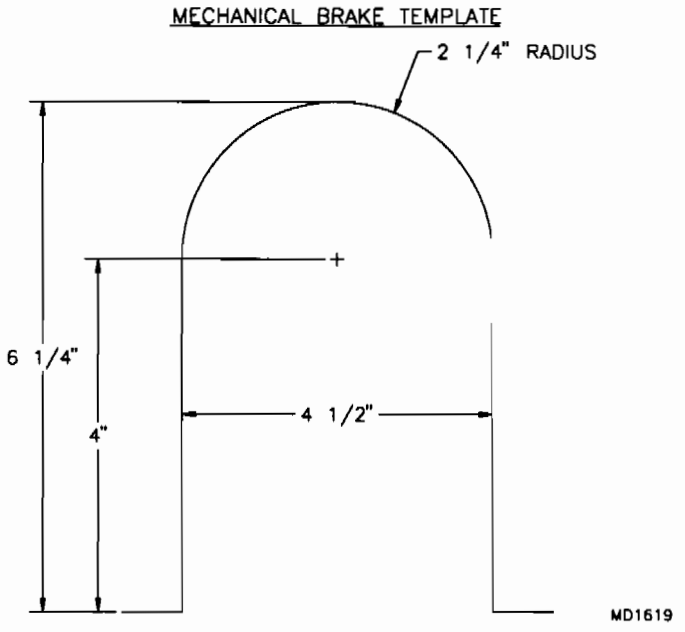
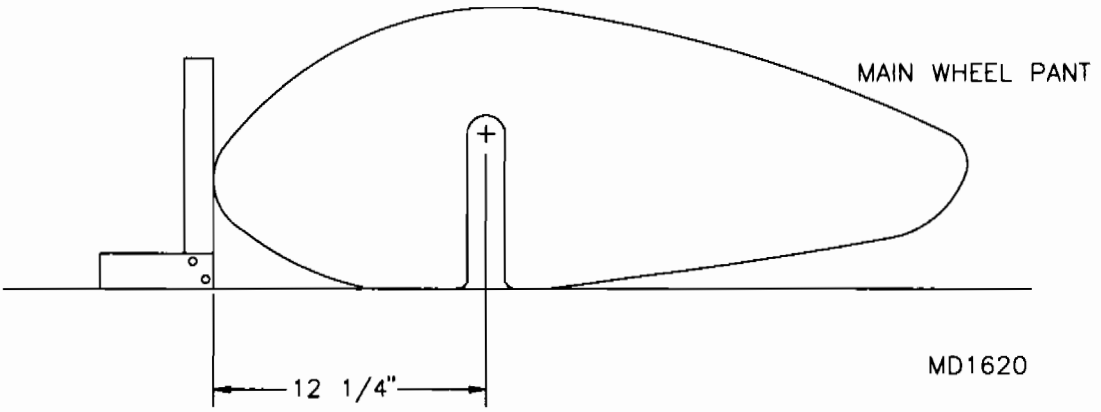


FIGURE 20G-03A



4. Install the longer axle in the socket using the same procedure outlined in the main gear section of your manual. Make sure the drilled and tapped end is facing out. Slide the wheel pant over the wheel assembly with the tabs on the **OUTSIDE** of the wheel pant and loosely install a bolt into the end of the axle.

5. To align the wheel pant, you will need to rotate it so that it matches the nose wheel's angle. If you are working on a level floor, you can measure up to a common point on each wheel pant to get the level location. Once you are happy with it's location, use the tabs to mark the hole locations in the wheel pants. Slip the wheel pant off and drill the tab holes.

6. Install the nut plates to the outside side of the tabs with the rivet heads to the inside. Slip the wheel pant over the wheel spreading it enough to slip **OVER** the tabs. Install the bolts to check fit. Remove, sand and paint to match.

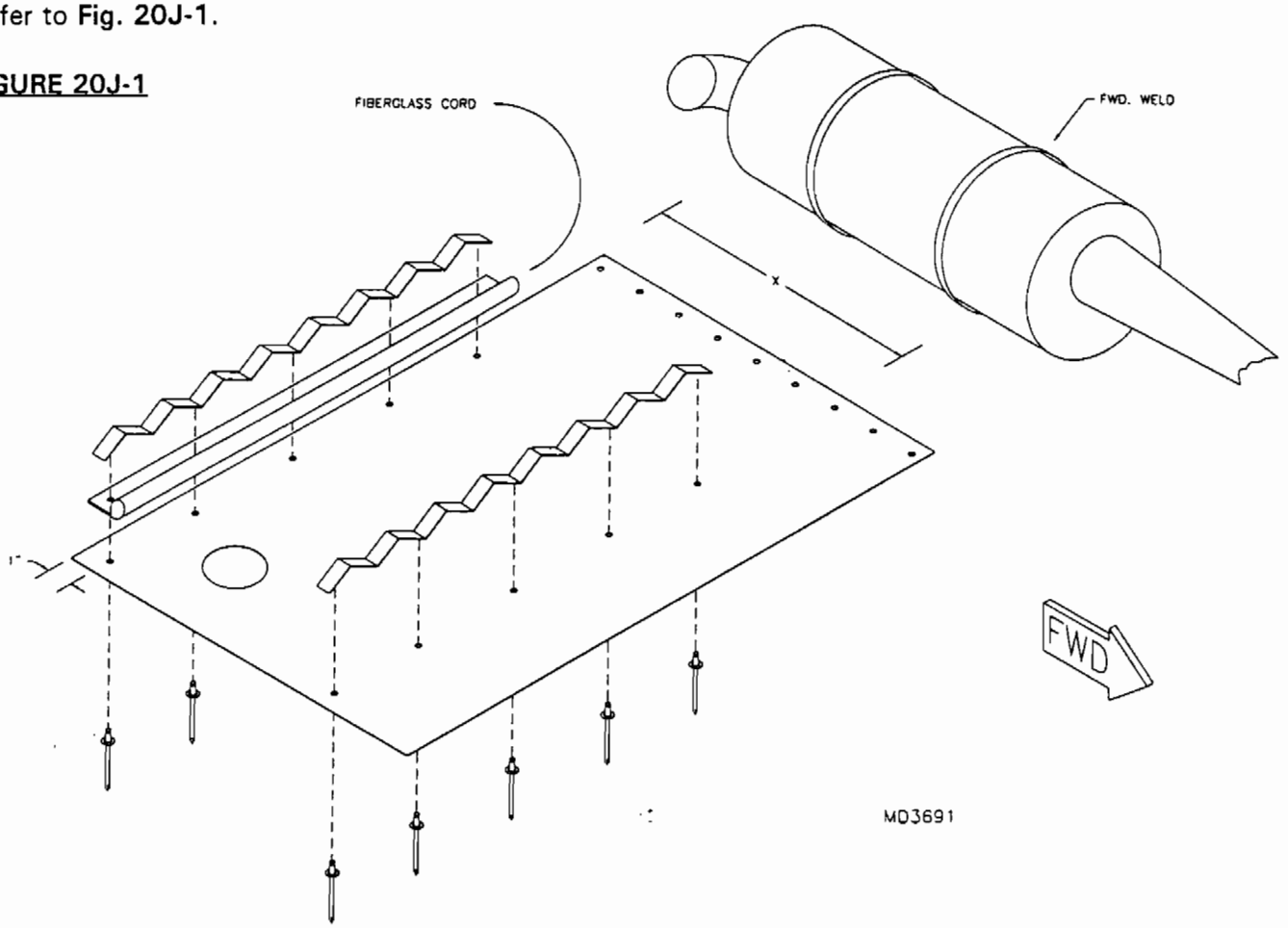
7. Final installation of the wheel pant requires blue loctite on the axle bolts. Inspect the wheel pants for loose bolts every pre-flight.

S-4/S-5 OPTIONAL MUFFLER HEATER

Muffler heater employs ram air passing through cylindrical wrap to transfer waste heat from muffler to cabin. Flow of heated air to cabin is controlled by twisting vented bushing near right rudder pedal.

1. Determine proper length of muffler wrap stand-offs by wrapping stand-off around muffler. Ends of stand-off must not overlap; trim excess. Locate forward stand-off to muffler wrap so stand-off will fit against leading edge of muffler's forward weld seam (thus retaining wrap during flight). Drill five #30 holes at regular intervals along forward stand-off; rivet stand-off to wrap. Locate fiber glass cord against leading edge of aft stand-off with cord's edging between stand-off and wrap. Drill five #30 holes at regular intervals along aft stand-off; rivet stand-off to wrap (thus retaining cord). Refer to **Fig. 20J-1**.

FIGURE 20J-1

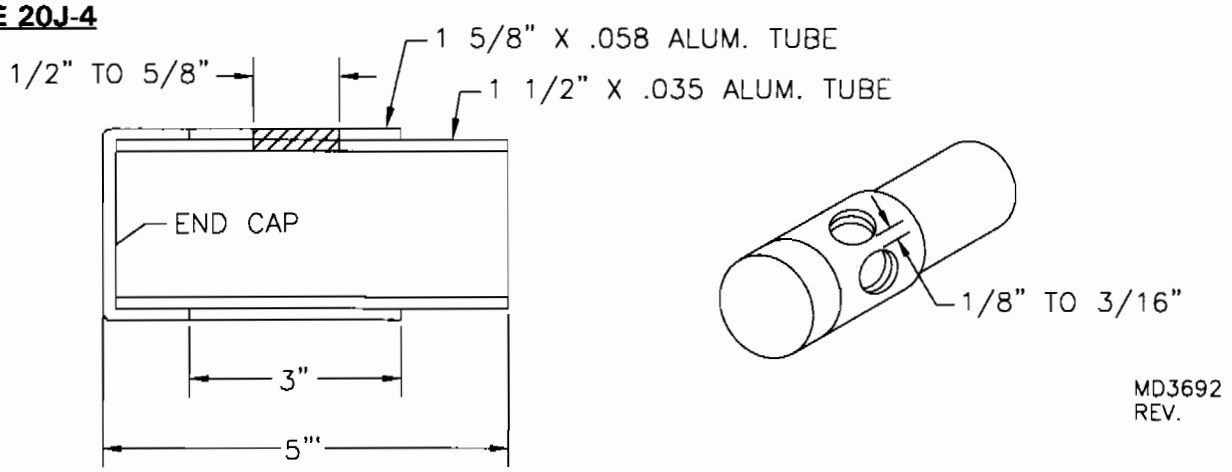


2. Bend heater wrap around muffler, overlapping edges far enough to provide snug fit; transfer drill #30 and rivet edges together. Locate inlet manifold over 1.5" opening in heater wrap, per parts drawing; transfer drill #30. Apply silicone sealant to base of manifold and rivet to wrap.

3. Transfer drill four #30 holes at ninety-degree intervals through both Lexan rings. Locate rings on aircraft skin, approximately nine inches forward of S-2, between cockpit bottom longeron and cockpit diagonal. Vent assembly installs through Lexan rings. ***Locate rings carefully; completed vent assembly must not impinge upon laces, lacing strip or rudder cable!*** Once located, penetrate skin through rivet holes of one ring (stiff, sharpened wire works well) and place remaining ring against other side of skin; rivet rings together, sandwiching skin. Refer to parts drawing.

4. To fabricate inner and outer vent tubes, cut 1 1/4" from 1.625" x .058 raw stock and 3" from 1.5" x .035 raw stock. To properly align vent holes, assemble tubes and end cap per **Fig. 20J-4**; transfer drill three ½" to 5/8" holes around middle of outer tube, allowing 3/16" to 1/8" between holes' edges. **See Fig. 20J-4**. Deburr all edges.

FIGURE 20J-4



5. Remove skin within Lexan rings (a sharp blade works well; a hot knife may be used to smooth edge of hole, sealing frayed ends). Slide inner vent tube through Lexan rings; inside cabin, slide outer vent tube onto inner vent tube; place end cap over inner vent tube, retaining outer vent tube snugly against Lexan ring. Once vent assembly is properly installed, slide retainer ring against Lexan ring on outside of aircraft. Drill #30 through both retainer ring and inner vent tube; rivet. See parts drawing.

6. Rotate heater wrap so inlet manifold is downward. Cut creet hose to proper length and install between inlet manifold and inner vent tube with hose clamps.

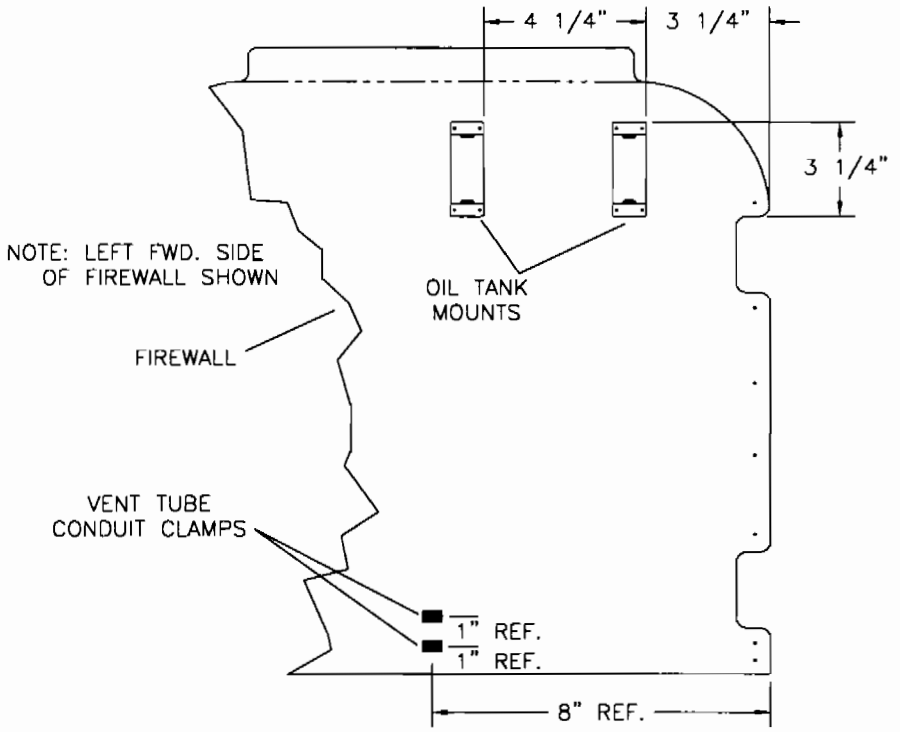
Outer vent tube should rotate smoothly on inner vent tube, allowing pilot to adjust air flow as desired. If rotation is restricted, check for burrs between tubes; if necessary, apply small amount of oil between tubes.

S-4/S-5 OPTIONAL 503 OIL INJECTION SYSTEM

Rivet holes through firewall for tank mounts and vent tube clamps are most easily drilled prior to installing soundproofing to aft side of firewall. If drilled after installing soundproofing, take care not to damage soundproofing with bit.

1. Locate oil tank mounts and conduit clamps to firewall per **Fig. 20L-1**. Size-drill #30 through tank mounts and firewall; for conduit clamps, drill firewall #11. Rivet mounts and clamps in place.

FIGURE 20L-1



2. Apply Loc-tite to threads of withdrawal fittings and install fittings to oil tank, orienting them as in parts drawing.

3. Provided with the kit is an oil tank filler tube extension. If used, it allows filling of oil tank without removing the cowling. To install, use 5 minute epoxy on J & B weld, and glue the tube into the oil tank filler opening. Be sure both extension tube and tank is clean in glue zones prior to applying epoxy. **DANGER: Use only a small amount of epoxy, avoid excess or it will fall into the oil tank and may clog oil injection system.**

4. Install expansion cap to oil tank or filler tube extension, if used. Place oil tank in mounts and secure with clamps. Run fuel line from lower withdrawal fitting to oil filter and from oil filter to oil pump on back of starter housing; secure with line clamps. Refer to parts drawing.

5. Cut several inches from ¼" x .028 aluminum raw stock to use as oil tank vent tube. Install vent tube to conduit clamps on firewall. Run fuel line from upper withdrawal fitting to vent tube, securing with line clamps.

6. Install cable and housing between throttle splitter and oil pump, per parts drawing; cable lugs may require filing to fit splitter; remove lug from cable end at oil pump. Cut ¾" length of 5/16" x .035 steel tubing from raw stock and transfer drill #40 holes on centerline, per **Fig. 20L-6**; install to lever on oil pump with associated hardware (steel tube rides in lever; washers slip over tube and are retained by pins). Thread throttle cable through center holes of steel tube and retain with wire stop; refer to parts drawing. Refer to engine manual to set oil metering.

FIGURE 20L-6